FACTORS INFLUENCING ENTREPRENEURSHIP – A STUDY OF NIZAMABAD DISTRICT IN ANDHRA PRADESH

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ABSTRACT
Entrepreneurship is pivotal to economic progress of a nation. Development of entrepreneurs leads to rapid industrialization and thus paves the way for the prosperity and fortune of a country. An Entrepreneur is therefore called the wealth creator and an economic agent who plays a vital role in the economic growth and development of a country. The socio-economic, psychological and the cultural factors of the milieu naturally influence one's effort to be an entrepreneur. A congenial industrial environment can certainly foster entrepreneurship. But entrepreneurship requires one to have courage, ambition, optimism, and ability to take risks. If they are enterprising, ambitious and courageous enough to bear the risk, the community or society will develop in turn they pave the way for the development of the nation through rapid industrialization. Entreprenuers are persistent, passionate, adaptable and able to take risks. As a result, entrepreenuership can occur in a range of environments. However, the acquisition of these characteristics is to some extent conditioned by one's environment. During the post-independence decades in India there have been tremendous socio-economic and political changes. These changes have greatly influenced entrepreneurial activities in the country. The Fiver-Year Plans and Programmes of Industrial Development have also motivated entrepreneurs greatly.

KEY WORDS: Entrepreneurship, industrialization, environments, socio-economic and political changes.

Introduction

Entrepreneurship is a dynamic activity which entails the entrepreneur to initiate changes in the process of production, innovation in production, and is a mental attitude to envisage risk and uncertainty with a view to achieve certain strong motive. Dynamic entrepreneurship is the prerequisite to augment the economic performance of any enterprise which involves creating jobs, improving competitiveness, boosting exports, fostering economic growth, and reducing poverty. Entrepreneurship is a way of life and a habit of mind. A number of factors contribute in motivating the entrepreneurs to venture and emerge successful.

Review of Literature

Gangadhar etal have found that Characteristics of an entrepreneur that contribute to his success are the result of his achievement motivation. A successful entrepreneur must be a person with technological awareness, self-confidence and optimism, initiative, intelligence and creative thinking, ability to take calculated risks, independence, innovation, hard work, and accountability, problem-solving and future orientation.

M.M.P. Akhouri in his short essay has stressed that the basic features of entrepreneurship are propensity to take risk, strong need for achievement, economic insight, and management skill. These influence entrepreneurial development.
Narasimha Reddy et al identified the motivation factors including experience in the activity selected, good business opportunities, and opportunity to explore their strength and earn more money.
Manickavasagam et al concluded in their work that family members, friends and relatives influenced to start the entrepreneurial activity. In addition to this, the study highlighted that lack of training, lack of awareness, limited support from family members, lack of guidance and counseling, lack of finance and marketing are the initial problems of entrepreneurs.
G. Jayachandran, B. Vijayalakshmi and D. Himachalam in their study have analyzed the socio-economic background and motivational factors of the entrepreneurs and their role in the development of entrepreneurship in the small-scale industrial units in the Tirupati Industrial Estate. They have found that entrepreneurship development and industrial development are like two sides of the same coin. In fact, development of small-scale industries directly promotes entrepreneurship.

Micro, Small and Medium Enterprises (MSMEs)
Entrepreneurship and MSMEs development are the obverse and reverse of the same coin. MSMs enterprises are a good breeding ground for entrepreneurship. The growth of the enterprises mainly depends upon the level of entrepreneurship development in it. Therefore, considerable importance is attached to the identification, promotion and fostering of entrepreneurship in this sector. The need for a broad-based entrepreneurial class in India arises from the need to speed up the process of activating the factors of production, stimulating economic growth, dispersal of economic activities, development of backward and tribal areas, creation of employment opportunities and improvement in the living standards of the people and so on.
The MSME sector is a nursery of entrepreneurship. The Micro, Small and Medium enterprises are indispensable in the socio-economic development of any country. Initially they were called small –scale industries prior to the Micro, Small and Medium Enterprises Development Act, 2006. The role of small scale industries has always been supported in a country like India. Economic development necessarily denotes a process of change and upward movement of the entire social system manifested by an increase in productivity, socio-economic justice, improved institutions and attitudes. The process involves utilization of physical resources and it requires the tapping of human resources to the best possible extent for initiating the required change in the economies which are budding and gaining ground.

Definition of Micro, Small and Medium Enterprises in India
There exist several definitions of the term Micro, Small and Medium Enterprises (MSMEs), varying from country to country and varying between the sources reporting MSME statistics. The commonly used criteria at the international level to define MSMEs are the number of employees, total net assets, sales and investment level. If employment is the criterion to define, then there exists variation in defining the upper and lower size limit of a MSME.
In the Indian context, micro, small and medium enterprises as per the MSME Development Act, 2006 are defined based on their investment in plant and machinery (for manufacturing enterprise) and on equipments for enterprises providing or rendering services. According to the Micro, Small and Medium Enterprises (MSME) Development Act of 2006, (India) a micro enterprise is where the investment in plant and machinery does not exceed twenty five lakh rupees. A small enterprise is where the investment in plant and machinery is more than

twenty five lakh rupees but does not exceed five crore rupees and a medium enterprise is where the investment in plant and machinery is more than five crore rupees but does not exceed ten crore rupees.

In the case of the enterprises engaged in providing or rendering of services, as a micro enterprise is where the investment in equipment does not exceed ten lakh rupees. A small enterprise is where the investment in equipment is more than ten lakh rupees but does not exceed two crore rupees and a medium enterprise is where the investment in equipment is more than two crore rupees but does not exceed five crore rupees.

Objective, Scope and Design of the Study

The present article makes an attempt to study the major factors influencing entrepreneurs in promoting their entrepreneurship in the Nizamabad district of Andhra Pradesh. The scope of the study is limited to Micro, Small and Medium Entrepreneurs (MSMEs) only in the Nizamabad district of Andhra Pradesh. The Nizamabad district comprises three divisions namely Nizamabad, Bodhan and Armoor. The data was collected from all regions in the Nizamabad district.

In pursuance of the above objective the necessary data has been collected both from the secondary and primary sources. The primary data has been collected from the sample entrepreneurs with the help of pre-tested schedules in the Nizamabad district. The secondary data for this study has been collected from the records and the published reports of the District Industries Centre (DIC), Chief Planning Officer, Nizamabad, Commissioner of Industries (A.P.,), and Ministry of Industries, New Delhi.

A representative sample of 75 Entreprenuers drawn through the convenience sampling method comprises of entrepreneurs/business owners who have started their own businesses or enterprises in Nizamabad district of Andhra Pradesh. The sample designed for this study is partially exploratory as it attempts to uncover the various motivating, compelling and facilitating factors in entrepreneurship. The design is basically descriptive in approach in the sense that it tries to establish relationship between two and more variables.

The data has been collected personally from the entrepreneurs through a structured schedule. The schedule contains profile of the entrepreneurs and enterprises, socio-economic factors, growth factors of entrepreneurs like ambitious factors, compelling factors and facilitating factors, followed by problems of entrepreneurs and enterprises. An analysis of the data has been carried out to draw the inferences, the details of which are in the following paragraphs.

Factors Influencing Entrepreneurship

Entrepreneurs are motivated to start a business/ enterprise because of the factors like ambitious factors, compelling factors and facilitating factors. Whatever may be the reason, it can be said that in most of the times of the history of human civilization, there were entrepreneurs who did independent business and this trend of history still continues. For the last few decades in all over the world, entrepreneurs are regarded as value adding people to the society. The common man thinks that people go into business and become entrepreneurs solely to make money. The desire to earn money is no doubt an important motivating force. But entrepreneurs are motivated not for profits alone. Several research studies have been conducted to identify the factors that inspire entrepreneurs.

Ambitious Factors of Entrepreneurs

Ambitions or aspirations motive men, activates them, widen their attitude and make their lives more meaningful and successful. Among the various factors which lead the entrepreneurs to their present involvement in business are to earn money, to secure self-employment, to improve status, to fulfill the ambition of self/parents/spouse, to continue

family business and there could be several other ambitions too. But it is well high impossible to make a list of all of them here, they are all subsumed under the title other ambitions. The details are shown in table no. I

Table No. I : Ambitions from Entrepreneurship
(Multiple Responses)

Ambitions	Frequencies (N=75)	Percentage
To earn money	48	64.0%
To secure self-employment	36	48.0%
To improve status	24	32.0%
To fulfill the ambition of self/parents/spouse	40	53.30%
To continue family business	30	40.0%
Others	9	12.0%

Source: Field Survey

The above table no. I show that, 64.0 per cent of entrepreneurs started their ventures with 'to earn money' ambition, 48.0 per cent with 'to secure self-employment', 32.0 per cent with 'to improve the social status', 53.3 per cent with 'to fulfill the ambition of self/parents/spouse', 40.0 per cent with 'to continue family business' and 12.0 per cent with 'the other factors'**.** It is clear from the above data that, becoming an entrepreneur positively desire to earn high profits, to acquire wealthy and would also like to fulfill the desire of their living time.

Compelling Reasons :

The below Table No.II shows the compelling reasons which strained an entrepreneur to start their own firms/enterprises.

Table No. II : Compelling Reasons for Entrepreneurship
(Multiple Responses)

Compelling factors	Frequencies (N=75)	Percentage
Unemployment	40	53.3%
Dissatisfaction with the previous job / occupation	56	74.7%
To make use of idle funds	12	16.0%
Diversification of economic interests	36	48.0%
Lack of higher education	30	40.0%
Others*	20	26.7%

***Other compelling factors include Revival of sick units started by other family Members, maintenance of large families, to gain equal status with their relatives already who have socially and economically high position, etc

Source: Field Survey

The table reveals that, 74.7 per cent of sample entrepreneurs started their ventures due to their 'dissatisfaction with the previous job/occupation'. It is consisted that the major compelling reason to leave the earlier job and enter into entrepreneurship to start their own ventures. The other reasons vary like 'unemployment' as 53.3 per cent, 'diversification of economic interests' as 48.0 per cent, 'lack of higher education' as 40.0 per cent, 'others' as 26.7 per cent and 'to make use of idle funds' 16.0 percent respectively to enter or start their units/firms. To conclude that, dissatisfaction of the earlier job/occupation in terms of money

or recognition of their hard work, entrepreneurs are compelled to start their enterprises. On the other hand, lack of gainful employment also a factor influencing the entrepreneurship.

Facilitating Factors

Besides ambitions and compulsions, there are some other forces which urge people towards making persons as entrepreneurship. The facilitating factors which have encouraged towards entrepreneurship and set up enterprises are detailed in table no. III.

Table No. III : Facilitating Factors Leading to Entrepreneurship (Multiple Responses)

Facilitating factors	**Frequencies (N=75)**	**Percentage**
Success stories of entrepreneurs	**30**	**40.0%**
Previous employment of experience in the same line or related of the industry	**55**	**73.3%**
Sufficient money and property in hand	**40**	**53.3%**
Encouragement of relations / friends/spouse	**38**	**50.7%**
Training undergone	**22**	**29.3%**
Idea from bank / financial institutions	**25**	**33.3%**
Various subsidies and incentives -offered by the government	**19**	**25.3%**

Source: Field Survey

It reveals that the majority of the sample of 73.3 per cent have responded as "previous knowledge/employment of the industry" as a factor to lead to start the venture followed by 53.3 per cent as "sufficient money and property in hand". And 50.7 per cent because of "encouragement from relations/friends/spouse", 40.0 per cent because of the "success stories of entrepreneurs", 33.3 per cent said that "an Idea from bank/financial institutions", 29.3 per cent with the "training undergone" and 25.3 per cent for "various subsidies and incentives – offered by the government". These factors are facilitating to start the venture and lead the entrepreneurship. To conclude, the majority are of the opinion that they have been attracted towards 'a particular industry line' as either they have already had the experience/ knowledge.

Opportunity Factors

Setting up an enterprise, whether it small or big, is possible with the convergence of various socio-economic and supporting factors. Caste, religion, education, training, professional experience, financial institutions, trade information and government policy are the diverse factors that constitute a spectrum which in different combinations lend a helping hand to the entrepreneur.

The opportunities that attract the entrepreneurs are shown in table no. IV. As many as 53.3 per cent think about 'contacts', 48.0 per cent think of 'trade information' availability, 40.0 per cent were thought 'experience', 36.0 per cent were thought 'education', 33.3 per cent were thought that 'professional experience', 32.0 per cent were thought 'technical knowledge', 29.3 percent were thought 'capital', 18.7 per cent were thought 'government policy', 9.3 percent were thought that 'help from entrepreneurs' and 5.3per cent were thought 'caste' were the important opportunity factors helped to entrepreneurs to start their enterprises. It reveals that, very few responses of factors like capital, government policy, help from entrepreneurs and caste, are not regarding as helpful factors to setting up an enterprise.

Table No. IV: Opportunity Factors for Entrepreneurship
(Multiple Responses)

Opportunity Factors	Frequencies (N=75)	Percentage
Education	27	36.0%
Training/Experience	30	40.0%
Technical	24	32.0%
Professional Experience	25	33.3%
Caste	4	5.3%
Government Policy	14	18.7%
Trade Information	36	48.0%
Contacts	40	53.3%
Capital	22	29.3%
Help from Entrepreneurs	7	9.3%

Source: Field Survey

It may be noted that such socio-economic and supporting factors as trade information, contacts which is helpful to entrepreneurship, good education, training and experience in the same line or related lines, and professional experience are the five factors that facilitate entrepreneurs.

Factors Influencing Entrepreneurs' Selection of Line of Enterprise

The entrepreneurs may choose different lines of activity to start their venture. Now an account of their reasons for choosing particular lines of activity is provided. It is not easy to choose a particular line of industry. The creativity of the entrepreneur is located to vital test in such selection. Selections of the line of activity, choice of suitable location for it, determination of the initial size of the selected enterprise are all inter-related issue.

Table No. V: Selection of Specific Line of Enterprise
(Multiple Responses)

Selection of Specific Line of Activity	Frequencies (N=75)	Percentage
Easy to Enter	28	37.3%
Higher Profit Margin	33	44.0%
Previous Employment in the same line or related line	45	60.0%
No Competition	11	14.7%
Simple Technology	17	22.7%
Related to the previous profession	37	49.3%
Existence of Similar industry	22	29.3%
Advise of Family Members	41	54.7%
Others*	9	12.0%

*'other/ miscellaneous reasons' which include availability of raw materials, assured market, continuation of family business after the retirement of parents from management etc.,

Source: Field Survey

It could be seen from table no. V. that of the various reasons given by the sample entrepreneurs for selecting the entrepreneurial activities in which they were found, as many as 60.0per cent opinioned that 'the previous employment in the same line or related line' followed by 54.7 per cent as 'advise of family members'. The remaining of the selection reasons were mentioned by sample entrepreneurs as 49.3percent was 'related to the previous

profession', 44.0percent was 'higher profit margin', 37.3percent was 'easy to enter', 29.3percent was 'existence in similar industry', 22.7percent was 'simple technology', 14.7percent was opinioned that 'no competition' and12.0percentwas opinioned 'other reasons' respectively. To conclude, that many of the entrepreneurs were found in the industry groups which are in same or related lines they were previously employed.

Suggestions:

An entrepreneur, the central figure of economic activity and propeller of progress, plays a crucial role in determining the level of development in any nation. An entrepreneur should have several special characteristics that help them to become a successful businessman. An entrepreneur should be a risk taker; he/she should be innovative, self-confident, goal setter, hard worker, and accountable. In other words, entrepreneurs must be persistent, self-confident, creative, and optimistic and independent minded. They are realistic about working hard and driving toward measurable results, tend to have superior conceptual abilities and are generally emotionally stable. Not only theses characteristics develop the entrepreneurial talent whereas the entrepreneurial creativity should also be developed through proper training and learning.

Based on the interpretation and analysis of the data the following conclusions have been drawn:

- To enhance Entrepreneurship involves the community, family, the academy, financial players, government, industry, and potential entrepreneurs themselves.
- Promoting Entrepreneurship means encouraging people to be self-reliant in taking economic decisions and creating wealth and employment.
- To Increase networks with other entrepreneurs to encourage sharing of ideas and experiences, and to mentor upcoming entrepreneurs.
- Appropriate training and experience are the important prerequisites to achieve competent entrepreneurship. The developmental institutions can render great service in educating and training prospective as well as young entrepreneurs.
- The success stories of other entrepreneurs helped these entrepreneurs in developing the necessary motivation and the drive to go in for the small scale business. Previous experience, encouragement from relatives and friends has also been helpful for entrepreneur's movement.
- Selection by entrepreneur of specific enterprises (business) is based on the availability of technical knowhow, lack of competition in that area and previous experience etc.

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ROLE OF MICRO FINANCE INSTITUTIONS FOR ACHIEVING FINANCIAL INCLUSION IN INDIA

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Abstract

Microfinance institutions are playing a significant role in achieving the objective of financial inclusion in India. Various steps have been taken by Reserve Bank of India for achieving the objective of financial inclusion and microfinance is one of the major tools that have been used. The present study purposes the performance of selected microfinance Institutions and the overall progress of microfinance program from 2009-12. Sample size taken for the study is 20 institutions selected on the basis of their loan portfolio. The result of the study when analyzed with the help of t-test has shown a significant improvement in the performance of Microfinance Institutions in terms of gross loan portfolio as an indicator. It can be concluded that the objective of Financial Inclusion can be achieved somehow with the help of microfinance program and focused implementation of the guidelines of Reserve Bank of India.

KEYWORDS: *Financial Inclusion, Gross loan portfolio, Microfinance, RBI.*

Introduction

Financial inclusion has been defined as the "Provision of affordable financial services" (RBI, 2006a) to those who have been left unattended or under attended by formal agencies of the financial system. These financial services include "payments and remittance facilities, savings, loan and insurance services" (ibid.). Micro finance has been looked upon as an important means of financial inclusion in India (RBI, 2006b). The Indian concept of micro finance encourages access of SHGs to banks both as means of savings and providers of loan services. However, going a step further, we can say that micro finance has to act proactively not just as a means of financial inclusion and also has to work towards reducing dependence of poor borrowers on various informal sources of credit that are often notorious for the onerous terms at which they offer

credit. Given the definition of financial inclusion, any means for financial inclusion, to begin with, has to be not just easily accessible but also affordable to the borrowers, who do not have access to formal financial system. Secondly, it should ensure that over time the borrowers are able to reduce their dependence on informal sources of finance and a certain degree of loyalty towards SHGs, which can work towards permanent or effective inclusion of these borrowers into the formal banking network. The importance of financial inclusion stems from various factors. First, an inability to access financial services could lead financially excluded entities to deal mostly in cash, with its attendant problems of safe-keeping. Second, the lack of access to safe and formal saving avenues could reduce their incentives to save. When saving occurs, safety and interest rate benefits may not be to the extent available in the formal system. Inadequate savings could lead households to depend on external sources of funds, in times of need. Often these sources are unregulated and carry high interest rates. High interest rates increase the risk of default by borrowers. Third, the lack of credit products means inability to make investments and significantly improve their livelihoods. As a result, small entrepreneurs often lack an enabling financial environment to grow. Fourth, the lack of remittance products leads to money transfers being cumbersome and high risk. Fifth, the lack of insurance products means lack of opportunities for risk management and wealth smoothening. According to C. Rangarajan there are six approaches in the system of Financial Inclusion, they are, as follows.1). Credit to the farmer households is one of the important elements of financial inclusion among them providing credit to the marginal and sub marginal farmers as well as other small borrowers is crucial to the need the hour. 2) Rural branches must go beyond providing credit and extend a helping hand in terms of advice on a wide variety of matters relating to agriculture. 3) In district where population per branch is much higher than the national average commercial banks may be encouraged to open the branches.4) There is need for the simplification of the procedures in relation to granting of loans to small borrowers. 5) The further strengthening the SHG-Bank Linkage Programme (BLP), as it has proved to be an effective way of providing credit to very small borrowers. 6).The business facilitator and Correspondent Model Needs To Be Effectively Implemented.

Progress of Microfinance in India

The institutions which engage in microfinance services in India follow three types of approaches namely

i. The Grameen Bank approach

ii. The Cooperative Societies (which are members of a cooperative bank) approach

iii. The SHG Programme approach.

In the four years between 2003 and 2007, small borrower bank accounts (credit) i.e. up to Rs 25,000 increased marginally from 36.9 million to 38.6 million, while SHGs borrowing members grew from 10 million to 40.5 million and MFIs borrowers grew from 1.1million to 8 million. In 2007-08, MFIs have added 6 million clients increasing their outreach to 14 million as per data brought out by Sa Daan. An innovative scheme in rural delivery system launched by NABARD is the linking of SHGs of the poor with banks and bulk lending through NGOs. NABARD considers SHGs a pre-microenterprise stage for majority of the rural population. The linkage project envisages active involvement of NGOs who play a crucial role in formation, nurturing, stabilizing and guiding the SHGs into cohesive and dynamic groups inculcating the habits of thrifts and credit management and ultimately establishing linkage with the banks. Under the SHG-bank linkage programme, three linkage models have broadly emerged. Under the first model, banks directly link SHGs without the intervention of the NGOs. In the second model, banks provide credit to SHGs and NGOs act as Self Help Promoting Institutions (SHPIs). Under the third model, NGOs act both as SHPIs and financial intermediaries for channelizing credit from banks to SHGs. The SHG-Bank Linkage Programme implemented by commercial banks, RRBs and cooperative banks has emerged as the major micro- finance programme in the country. Under the SHG-Bank Linkage Programme, as on March 31, 2009, 61,21,147 SHGs held savings bank accounts with total savings of Rs 5,545.62 crore as against 50,09,794 SHGs with savings of Rs 3,785.39 crore as on March 31, 2008. Thus more than 8.06 crore poor households were associated with banking agencies under the SHG- Bank Linkage Programme.

Table 1: The Progress under SHG bank Linkage Programme in India

Year	New SHGs financed by banks					Bank Loan
	During the Year		Cumulative during the Year			Cumulative Amount
	No.	Growth (%)	No.	Amount	Growth (%)	
2002-03	2,55,882	29	7,17,360	1,022.34	87	2,048.68
2003-04	3,61,731	41	10,79,091	1,855.53	81	3,904.21
2004-05	5,39,365	49	16,18,456	2,994.25	62	6,898.46
2005-06	6,20,109	15	22,38,565	4,499.09	50	11,397.55
2006-07	11,05,749*	-	28,94,505	6,570.39	-	12,366.49
2007-08	12,27,770*	11	36,25,941	8,849.26	35	16,999.90
2008-09	16,09,586*	31.1	42,24,338	12,256.51	38.5	22,679.85

Source: Govt. of India, 2009

* from 2006-07 onwards, data in respect of number of SHGs financed by banks and bank loans are inclusive of SHGs financed under the Swarna Jayanti Gram Swarozgar Yojana (SGSY) and the existing groups receiving repeat loans. Owing to this change, NABARD discontinued compilation of data on cumulative basis from 2006-07. As such data from 2006-07 onwards are not comparable with the data of the previous years. As on March 31, 2009, commercial banks had the maximum share of SHG savings with savings of 35,49,509 SHGs (58 per cent) amounting to Rs 2,772.99 crore(50 per cent); this was followed by RRBs with savings bank accounts of 16,28,588 SHGs (26.6 per cent) and savings amount of Rs1,989.75 crore (35.9 per cent) and cooperative banks with savings bank accounts of 9,43,050 SHGs (15.4 per cent) and savings amount of Rs 782.88 crore (14.1 per cent). The share of the Swarnajayanti Gram Swarozgar Yojana (SGSY) in SHG savings accounts was 15,05,581 SHGs, forming 25 per cent of the total SHGs having savings accounts in banks. During 2008-09, the average savings per SHG with all banks increased from Rs 7,556 as on March 31, 2008 to Rs 9,060 as on March 31, 2009,varying between a high of Rs 12,218 per SHG with RRBs and a low of Rs 7,812 per SHG with commercial banks. As on March 31, 2009, the share of women SHGs in total SHGs with savings bank accounts was 48,63,921, accounting for 79.46 per cent as compared to the previous year's share of 79.56 per cent. During 2008-09, banks financed 16,09,586 SHGs, including repeat loans to existing SHGs, as against 12,27,770 SHGs during 2007-08—a growth of 31.1 per cent (number of SHGs). As on March31, 2009, 42,24,338 SHGs had outstanding (cumulative) bank loans of Rs 22,679.85 crore as against 36,25,941 SHGs with outstanding bank loans of Rs16,999.90

crore as on March 31, 2008. This included 9,76,887 SHGs (6.5 percent) with outstanding bank loans of Rs 5,861.72crore (21.7per cent) under the SGSY as against 9,16,978 SHGs with outstanding bank loans of Rs 4,816.87 crore as on March 31, 2008. Commercial banks had the maximum share of around 70 percent of outstanding bank loans to SHGs followed by RRBs with a share of 23 per cent and cooperative banks with the balance. As on March 31, 2009, the average bank loan outstanding per SHG was Rs53,689 as against Rs 46,884 as on March 31, 2008. It varied from a high of Rs 57,037 per SHG in the case of commercial banks to a low of Rs 31,460 per SHG in the case of cooperative banks.

Literature of Review

In 2011, Priyadarshee and Ghalib describe a process whereby the MFIs not only offered multiple loans to the same borrower household without following due diligence, but also collaborated with consumer goods companies to supply consumer goods such as televisions as part of their credit programmes. These purely consumption loans exacerbated the already worsening indebtedness of poor households and some of them started defaulting in repayment. Several MFIs then resorted to openly coercive methods for loan recovery. Extreme repayment pressure forced borrowers to approach moneylenders to borrow at exorbitant rates of interest simply to repay the MFIs. When the situation became impossible, and no fresh loans were accessible, some of these borrowers committed suicide and the issue attracted widespread media coverage. In 2012 Dr.Christabell. P.J. Vimal Raj A. defined the overall strategy for financial inclusion, especially amongst the poor and disadvantaged segments of the population. It comprises ways and means to effect improvements within the existing formal credit delivery mechanism, as well as an evolution of new models for extending outreach, and a leverage on technology solutions to facilitate large scale inclusion. Only two to five percent of the 500 million poorest households in the world have access to institutional credit. Of which, women receive a disproportionately small share of credit from formal banking institutions. The Women's Self Help Group movement is bringing about a profound transformation in rural areas of India. In 2013 Porkod examine the role of micro finance in the empowerment of people and the realisation of financial inclusion in India. While there are reservations about the efficacy of MFIs in handling public

money, their growth and achievements demand attention and appreciation. Shankar Savita (2013), found that while MFIs do break down many barriers to financial inclusion, there are limitations in the extent of their outreach to those excluded. First, MFI penetration in the country is skewed and excludes some areas neglected by the banking sector, suggesting a need for policy incentives to encourage expansion to those areas. Second, even in areas in which MFIs operate they are unable to provide services to some financially excluded individuals on account of their methods of operation. To provide greater and more long lasting access to more individuals there is a need for MFIs to consider adopting more flexible operating models and to offer portability of accounts. There is also a case for skill based training to enable greater access to MFI membership.

Objectives of the study

To study the performance of selected microfinance institutions on the basis of gross loan portfolio and the progress of overall microfinance program for achieving financial inclusion.

Research Methodology

Descriptive type of study has been done. The sample size include 20 microfinance institutions (NGOs and NBFCs) which provides their data on MIX (mix market) database. The period taken for the study is of 3 years i.e from 2009-12. The statistical tool t-test has been applied to draw the results.

Data Analysis

Table 2

ONE-SAMPLE TEST

	Test Value= .05					
	T	Df	Sig.(2-taoiled)	Mean Difference	95%Confidence Interval of the Difference	
					Lower	Upper
Gross Loan Portfolio	19.742	2	.003	6.29011E9	4.9192E9	7.6610E9

The result of the table no.1 depicts that there is significant difference between the loan portfolios of the selected Microfinance Institutions from the year 2009-12. When calculated at 95% confidence level, the t-value comes out to be 19.742 that is more than

the tabulated value (19.742>2.92), showing the performance has increased significantly which in turns helps in achieving Financial Inclusion in India

Conclusion

The Micro Finance Institutions are an integral part of financial inclusion and instrumental in providing "last mile connectivity" but there need to be a balance. They should be kept viable but within certain boundaries. At present, these MFI across the country is under stress. The Reserve Bank of India has set up a committee under the chairmanship of Mr. Y. H. Malegam to examine the issues confronting the microfinance industry, including their interest rate structure and suggest recommendation. For achieving complete financial inclusion and for inclusive growth microfinance institutions are playing their role significantly. Access to financial services could be made more easily and effectively by means of SHGs and MFIs. Financial inclusion is a big road which India needs to travel to make it completely successful. Financial inclusion will be real and successful only when the small and marginal farmers and landless labourers have unhindered access to the financial services like Savings, Credit, Micro insurance and remittance facilities.

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Room temperature ferromagnetism in $Cd_{1-x}Cr_xTe$ diluted magnetic semiconductor crystals

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ABSTRACT

$Cd_{1-x}Cr_xTe$ diluted magnetic semiconductor crystals were grown by vapor phase growth technique in the composition range of $0 \le x \le 0.05$ and the effect of Cr doping on structural, morphological, optical and magnetic properties have been explored. X-ray diffraction analysis confirmed that all the grown crystals were zinc blende in structure without having any phase transition up to a Cr doping level of $x=0.05$. The lattice parameter decreased with increase in Cr doping level. Optical studies indicated that the optical band gap of the crystals decreased with the increase of Cr doping level. Magnetic properties were studied using vibrating sample magnetometer at room temperature and room temperature ferromagnetism was observed in all the Cr doped CdTe crystals.

1. Introduction

Spintronics is an emerging technology in which both intrinsic spin of electron and the fundamental carrier charge play vital role. The diluted magnetic semiconductors (DMSs) are the most promising materials for the spintronic device applications. DMSs can be obtained by substituting the magnetic transition metal ions such as Mn, Cr, Fe, Co, Ni etc. and other rare earth metals into a conventional non-magnetic semiconductor compound [1]. For the past two decades, extensive studies were carried out on II–VI, III–V and IV–VI DMS compounds for room temperature ferromagnetism due to s, p–d interactions [2,3]. The relevance in DMS has been motivated by their peculiar electronic, magnetic and magneto-optical properties due to the tunability of band gap and lattice parameters by varying the magnetic ion concentration [4]. It is fascinating to see that the transition metals find greater solubility in II–VI compound semiconductors, when compared to other compound semiconductors. It is easier to incorporate magnetic ions with +2 oxidation state into the host lattice of II–VII compound DMS such as ZnTe, ZnSe, CdSe and CdTe [5]. In the II–VI semiconductors, Mn doped DMS find very few applications, as they possess spin glass or antiferromagnetic property [6]. Ferromagnetic ordering was observed, when the transition metal ion such as Cr is doped into II–VI semiconductors [7]. This is due to the fact that Cr metal ion played a dual character by creating a hole carrier as well as a ferromagnetic impurity in the host semiconductor [8]. The super exchange interaction between the Cr^{2+} ions is responsible for the origin of ferromagnetism in Cr doped II–VI semiconductors. Till now very few reports are available on Cr doped II–VI DMS when compared to Mn based II–VI diluted magnetic semiconductors. Among the II–VI semiconductors, CdTe with a band gap of 1.45 eV is a promising candidate as a host material for DMS. Recently, Noor et al. [9] with their theoretical predictions confirmed half metallic ferromagnetism in Cr doped CdTe crystals. Very few researchers had

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made their attempt for room temperature ferromagnetism in Cr doped CdTe crystals [10]. Since reports on Cr doped CdTe crystals are meager, a systematic investigation on compositional dependence on room temperature ferromagnetism is required. Hence in the present study, the effect of Cr doping on structural, optical and magnetic properties of vapor phase grown $Cd_{1-x}Cr_xTe$ crystals has been studied.

2. Experimental

$Cd_{1-x}Cr_xTe$ crystals with different Cr concentrations ($0 \le x \le 0.5$) were grown from pure CdTe and CrTe by modified vapor phase growth technique [11]. CdTe and CrTe (99.99% M/S Sigma Aldrich) were used as source materials. As the cubic phase of CrTe is not stable, CrTe in cubic phase was prepared afresh. Stoichiometric quantities of CdTe and CrTe were mixed and ground thoroughly using an Agate mortar and pestle for about 12 h. The mixture was sintered at 500 °C in a quartz tube under a pressure of 2×10^{-3} Torr for 12 h and cooled down slowly to room temperature. This sintered material was ground again for 6 h and used as charge for crystal growth. The ground charge is then loaded in a well cleaned growth tube (quartz) and the opening end is drawn into a fine capillary of 20 cm length leaving a space of 10 cm from charge for growth of the crystal. The growth tube was carefully introduced in well cleaned protective quartz tube, evacuated to a pressure of 2×10^{-3} Torr. The total set up was placed in a programmable horizontal furnace such that the charge is positioned at the highest temperature zone. The temperature of the furnace was slowly raised to 980 °C at a rate of 20 °C/h and maintained at 980 °C for 48 h before cooling to room temperature at a rate of 10 °C/h. Each growth run lasted 5–6 days. The growth tube was carefully removed from the furnace and the crystal boules were taken out by gently breaking the growth tube. The optimum growth conditions for growing the Cr doped CdTe crystals were arrived through trial and error. Good quality crystals of 1–2 cm long were grown in the present work and the photographs of the as-grown crystals are shown in Fig. 1. The grown crystals were subjected to structural, morphological, optical and magnetic characterization. Powder X-ray diffraction (XRD) patterns of the grown crystals were recorded using Bruker, D8 Advance diffractometer equipped with Ni filter and operated at 40 kV, 30 mA (CuK_α radiation, $\lambda = 0.15406$ nm) with a scan speed of $0.02^\circ\ s^{-1}$ in the 2θ range of 20–80°. The elemental compositions and surface morphology of the samples were determined by energy dispersive analysis of X-rays (EDAX Genesis X4M) attached to scanning electron microscope (SEM JSM 840A). The room temperature diffuse reflectance spectra for the samples

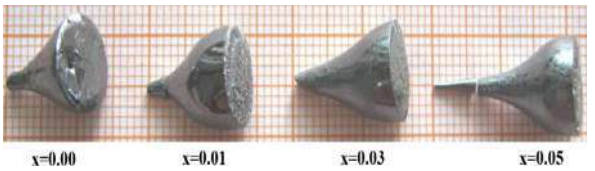

Fig. 1. Photograph images of grown $Cd_{1-x}Cr_xTe$ single crystals with different Cr concentrations.

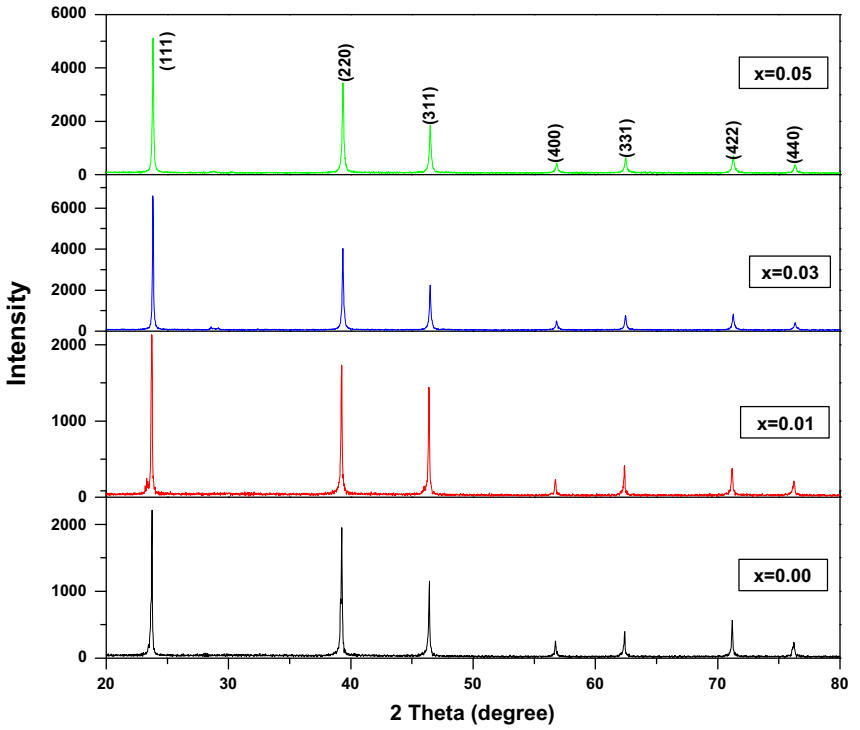

Fig. 2. Powder X-ray diffraction patterns of pure and $Cd_{1-x}Cr_xTe$ single crystals.

were recorded using double beam UV–vis–NIR spectrophotometer (Jasco V-670) in the wavelength range of 200–2500 nm. Magnetic studies were carried out with vibrating sample magnetometer (Lakeshore VSM 7410) with an applied field of 15,000 G.

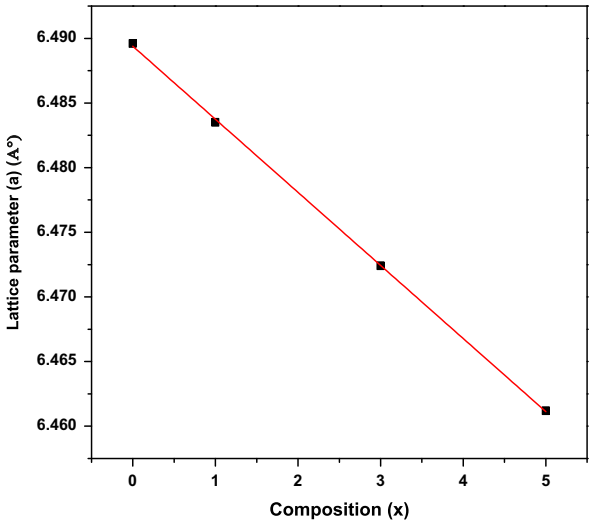

Fig. 3. Variation of lattice parameter of $Cd_{1-x}Cr_xTe$ single crystals with Cr composition (x).

3. Results and discussion

3.1. Structural analysis

Fig. 2 shows the XRD patterns of $Cd_{1-x}Cr_xTe$ crystals (x=0.00, 0.01, 0.03 and 0.05). All the patterns exhibited zinc blende structure with predominant orientation of (111) plane. All the diffraction peaks were indexed to *hkl* Miller planes using JCPDS data (89-3053) for cubic CdTe system. A gradual shift in the angular positions (2θ) of the XRD peaks to higher angles was observed with increase of Cr levels. No traces of XRD peaks pertaining to secondary phases and impurities were observed. The lattice constant '*a*' of the $Cd_{1-x}Cr_xTe$ crystals was calculated from XRD patterns and found to decrease linearly with increase of '*x*' obeying Vegard's law as shown in Fig. 3. This reduction in lattice constant with Cr doping may be due to smaller atomic radius of Cr (0.125 nm) when compared with atomic radius of Cd (0.158 nm). The decrease in lattice constant may also be due to strain in the host CdTe on fusion with the dopant species into the basic lattice. Similar decrease in lattice constant was reported in $Cd_{1-x}Cr_xTe$ [10] and $Cd_{1-x}Fe_xTe$ crystals [12].

3.2. Surface morphology and composition

Fig. 4(a) shows typical surface morphology of $Cd_{0.99}Cr_{0.01}Te$ single crystal. It was observed that the surface was smooth without any voids and pits. The existence of the

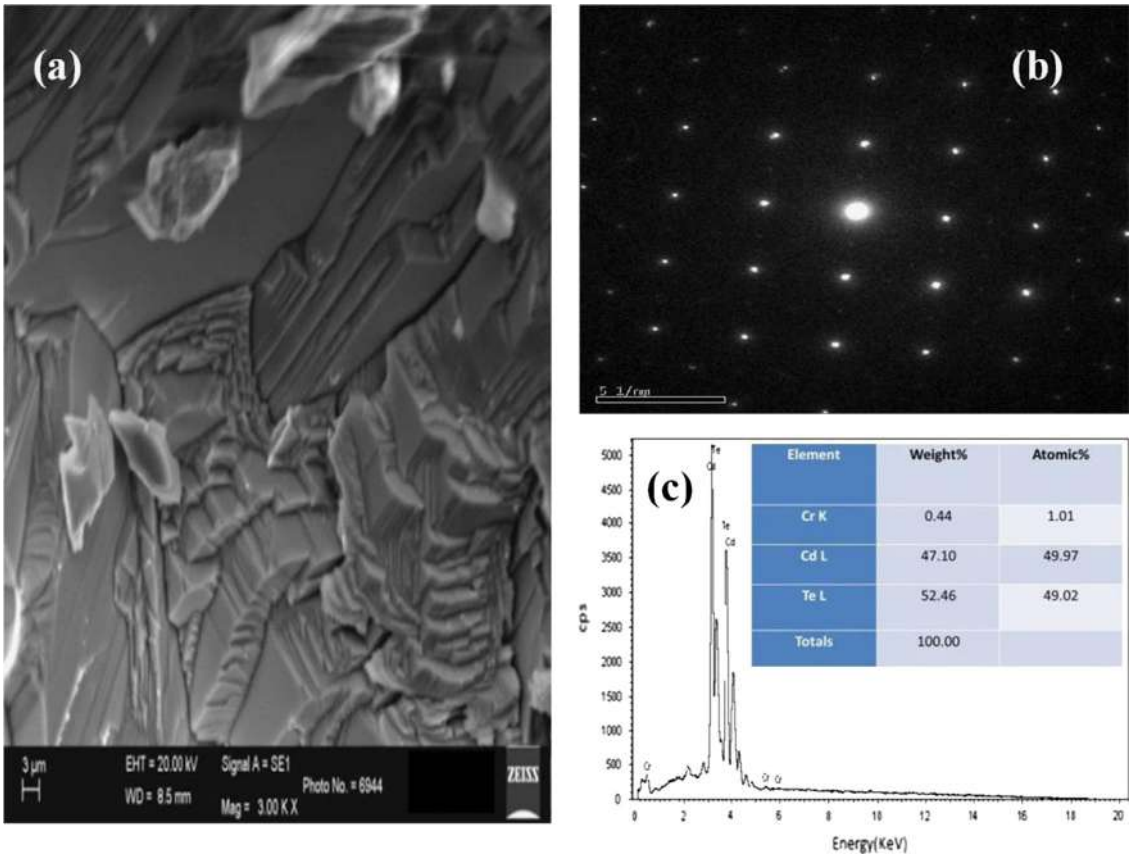

Fig. 4. (a) SEM image, (b) SAED pattern and (c) EDAX spectrum (inset) elemental composition of $Cd_{0.99}Cr_{0.01}Te$ single crystal.

growth layers might be due to unavoidable surface tension and interaction between the surface atoms. No reports are available on the growth patterns of Cr doped CdTe single crystal. However, Chandrasekharam et al. [11] have reported that the growth of ZnSe–CdTe crystals was due to active participation of screw dislocations associated with crystal anisotropy. Similar growth mechanism was also expected in the present system as it was also a CdTe based crystal with rather low concentrations of Cr. Hence, it could be inferred that this growth layers may have the origin and proliferation at and around screw dislocations coupled with the crystal anisotropy. Singh et al. [13] have also observed similar kind of ordered structures in the as grown bulk CdTe compound. Typical selected area electron diffraction (SAED) pattern obtained from diffracted regions of $Cd_{0.99}Cr_{0.01}Te$ single crystal is shown in Fig. 4(b). Electron diffraction studies confirm that the grown $Cd_{1-x}Cr_xTe$ crystals are single crystalline in nature. The elemental analysis of the grown single crystals has been carried out using EDAX. Fig. 4(c) shows EDAX spectrum of $Cd_{0.99}Cr_{0.01}Te$ crystal which shows percentage of Cd:Te:Cr as 49.97%:49.02%:1.01%, respectively.

3.3. Magnetic studies

Fig. 5(a–d) shows the field dependence magnetization (M–H curves) of $Cd_{1-x}Cr_xTe$ crystal samples measured at 300 K using vibrating sample magnetometer. These M–H plots revealed clear hysteresis loops indicating the ferromagnetic behavior of $Cd_{1-x}Cr_xTe$ crystals at room temperature. The hysteresis loops observed in the present study display a characteristic pattern of soft magnetic materials. Pure CdTe is diamagnetic in nature as observed in Fig. 5(a). Hence its magnetic susceptibility is negative and ferromagnetism was not expected. Whereas, a complete ferromagnetic behavior was observed in $Cd_{1-x}Cr_xTe$ crystal with $x=0.01$, 0.03 and 0.05. It can be interpreted that above room temperature ferromagnetic behavior

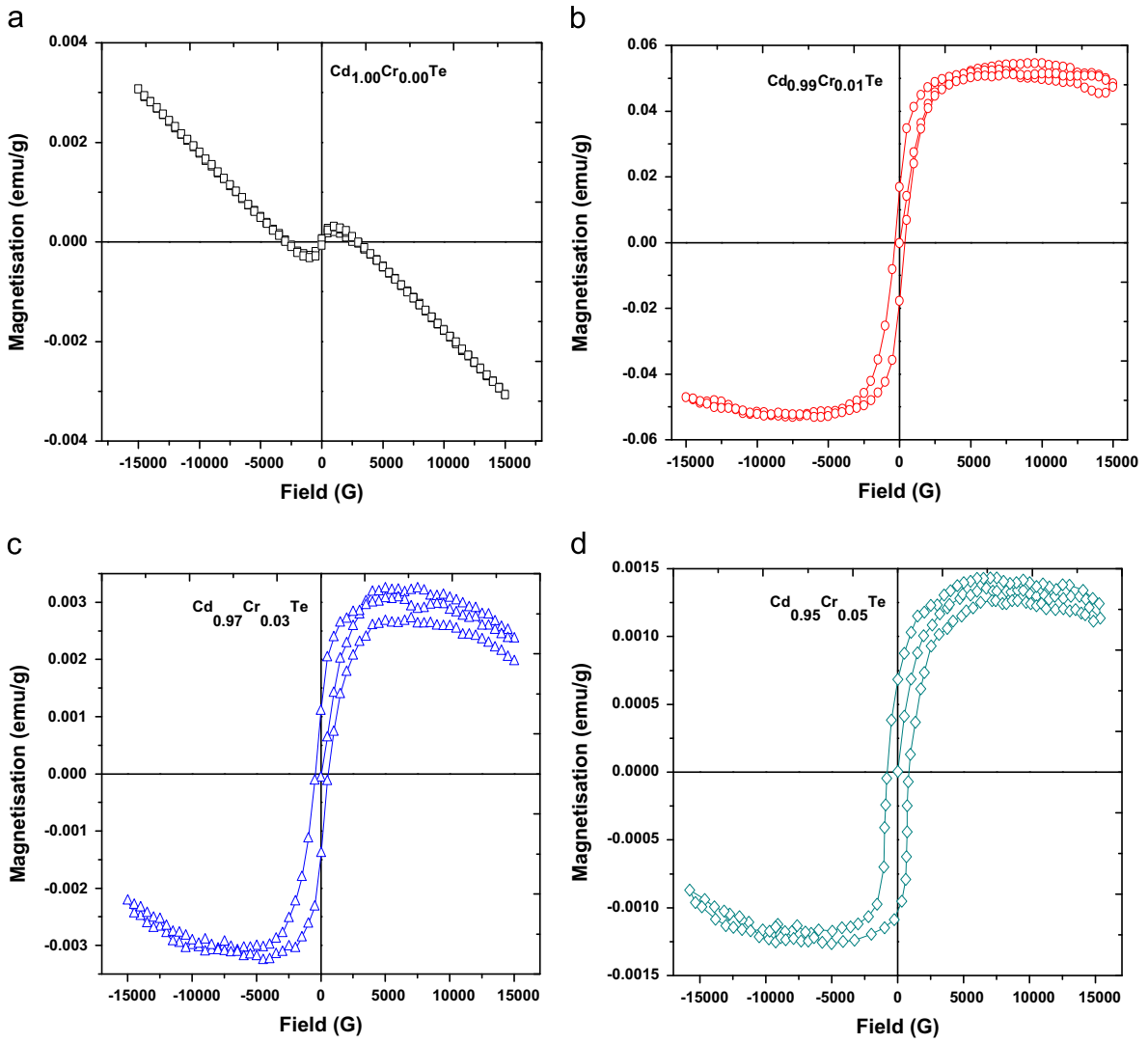

Fig. 5. (a–d) Hysteresis curves of $Cd_{1-x}Cr_xTe$ crystals.

would arise from the creation of a spin-split impurity band at the Fermi level, i.e. below the conduction band due to the hybridization between the charge carriers of Cr and Cd atoms. Hence, the observed ferromagnetism is due to super exchange interaction between localized 'd' spins of the Cr^{2+} and the free localized 'd' carriers [14]. Probability of inducing an extrinsic ferromagnetism due to Cr ions is not possible, as Cr ions are antiferromagnetic in nature [15]. It is quite obvious from Fig. 5(b–d) that the Cr doped CdTe crystals show a systematic change in the magnetic behavior with the increase in chromium content. This observed magnetic behavior depends strongly on the Cr content. The obtained values of magnetization (M_s) for $x=0.01$, 0.03 and 0.05 were 0.0538 emu/g, 0.0032 emu/g, and 0.0014 emu/g, respectively. It can be seen that as the Cr level was increased from $x=0.01$ to 0.05, a decrease in magnetic moment was observed. The decrease of magnetic moment and weakening of ferromagnetic behavior may be due to the fact that the excess Cr ions may occupy the interstitial positions, as Cr solubility in II–VI semiconductors is very low. It would result in reduction of the ferromagnetic exchange interaction as intrinsic Cr is antiferromagnetic. Similar kind of results were observed in Cr doped ZnTe crystals [16] and also in thin films [17]. Finally, the ferromagnetic behavior does not originate from any other phases, but it is attributed solely due to the substitution of magnetic ion (Cr^{2+}) for Cd^{2+} in the host CdTe.

3.4. Optical studies

Fig. 6 shows the diffused reflectance spectra of $Cd_{1-x}Cr_xTe$ ($x=0.00$, 0.01, 0.03 and 0.05) crystals in the photon energy range 1.25–6 eV. The reflectance spectra observed in the present study is as a result of band to band transition and is only due to an allowed direct transition from the top of valence band to the bottom of the conduction band at the center of the Brillouin zone. From the inset of Fig. 6, it was observed that the fundamental absorption edge (E_0) shifts systematically at the IR region towards lower energies (longer wavelength) with increase of Cr doping level. In the optical spectra of Te based compounds (ZnTe and CdTe) it is difficult to find the ($E_0+\Delta_0$) related transitions [18]. In the present study it is fascinating to observe the $E_0+\Delta_0$ structure in the spectra. The well defined structures obtained in the energy 3–6 eV regions are due to $E_0+\Delta_0$, E_1, $E_1+\Delta_1$ and E_2 transitions. The fundamental absorption edge E_0, is a direct allowed transition between the top valence band Γ_{15} and the bottom conduction band Γ_1 [19–21]. The E_1 and $E_1+\Delta_1$ peaks result from transitions from the spin–orbit split valence band Λ_3 to the Λ_1 conduction band. The E_2 peak of strong intensity is due to transition from X_5 valence band to the X_1 conduction band. In view of the similarity observed between the pure CdTe and Cr doped CdTe crystals of reflectivity spectra shown in Fig. 6, it is obvious that the presence of Cr^{2+} ions does not change the band energy structure. Furthermore, the band gap values obtained from the diffuse reflectance spectra decreases linearly with 'x' with increase in Cr concentration as shown in Fig. 7. The introduction of Cr^{2+} ions in the system may have led to defects. Width of energy gaps depend on concentration of defects. The increase of defect concentration diminishes the width of the energy gap. The decrease in energy band gap may be connected to bond length difference between CdTe (2.806 Å) and CrTe (2.78 Å) which in turn reduces the lattice parameter of $Cd_{1-x}Cr_xTe$ crystals or with impurity bands in the system with high level of defects. The introduction of impurities could result in increase of pressure at the grain boundaries [22]. It can, therefore, be speculated that the substitution of Cr^{2+} ions for the Cd^{2+} ions could alter the centers of the conduction and valence bands as well as band widths leading to the overall decrease in the band gap of the $Cd_{1-x}Cr_xTe$ crystals.

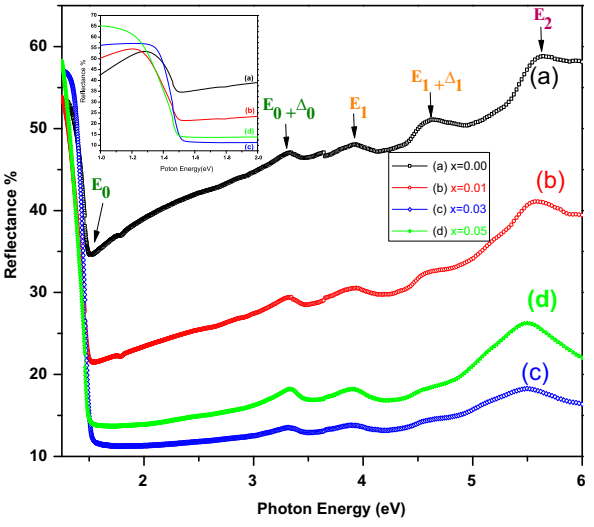

Fig. 6. Diffused reflectance spectra of pure and $Cd_{1-x}Cr_xTe$ crystals (inset) magnified view of fundamental band edge E_0 in the photon energy range.

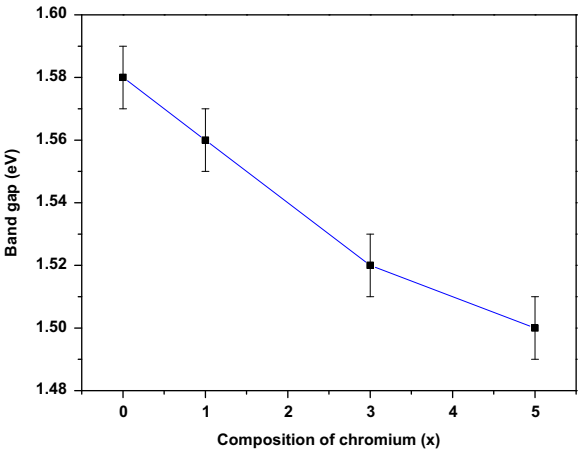

Fig. 7. Variation of optical band gap of $Cd_{1-x}Cr_xTe$ crystals with Cr concentration.

4. Conclusion

$Cd_{1-x}Cr_xTe$ single crystals were grown by modified vapor phase technique at Cr doping levels of $x=0.00$, 0.01, 0.03 and 0.05. XRD studies confirmed zinc blende structure for the $Cd_{1-x}Cr_xTe$ grown crystals. The lattice parameter decreased linearly with increase of Cr content following Vegard's law. Layered structures with no voids and pits on the surface and the presence of active dislocation aided growth in the grown crystals was observed. The measurements of vibrating sample magnetometer exhibited clear hysteresis loop showing room temperature ferromagnetism for all $Cd_{1-x}Cr_xTe$ grown crystals. As the Cr concentration increased, the magnetic moments were found to decrease. The diffuse reflectance spectra displayed regular shift in the fundamental absorption edge and the band gap energy was found to decrease with the increase in Cr level. In perspective to the origin of the ferromagnetism, coupling with XRD, optical and magnetic studies, it was concluded that ferromagnetism arised from the exchange interaction between Cr^{2+} ions and the Cd^{2+} ions in the CdTe host lattice.

Acknowledgments

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PRODUCTION AND LABOUR PROBLEMS OF GRANITE INDUSTRY IN PRAKASAM DISTRICT

Dr. C. Venkateswar Rao*
Dr. M.Reddi Naik**
Dr. M. Venkateswarlu***

Abstract

Prakasam district was one of the most imperative producers and leading exporters in terms of tonnage of granite stone in Andhra Pradesh State over the past decades. Prakasam district traditionally exports large quantities of raw blocks, rough slabs and standard tiles of granite. Because of abundant granite resources, attractive and qualitative raw granite products, cheap labour, interested entrepreneurs, are available in the Prakasam district. So the Prakasam district is a national leader in terms of granite production. Granite stone exports from the Prakasam district, comprise mainly granite cut blocks, granite slabs and tiles. Hence, the granite stone industry is more profitable in the district, at the same time the granite quarrying and processing industry has been creating a number of issues and problems in relation to labour. So the labourers are facing some problems and work under the inauspicious conditions. This paper highlights the issues of the labour occurred in granite stone quarrying and processing industry in Prakasam district.

Keywords: *Granite Production, Value, Labour Problems.*

Introduction

Granite quarrying and processing industry play a central responsibility in the economic development of Prakasam district. Granite processing industry encompasses the advantages of generating additional employment, with low investment, diversifying the industrial pedestal, plummeting regional disparities through dispersal of industries into rural, semi-urban and backward areas. Granite units are the large, medium and small scale units which play a catalytic role in achieving the national or state, regional level objectives of increasing industrial production, generation of additional employment, more evenhanded distribution of income and means of production and reducing regional disparities. Recognizing the suitability of granite industry has been accorded due priority in the Prakasam district. The granite processing industry has an imperative function in small scale industries for industrial development in the district. The Prakasam district with 766 Working Factories Registered Factories Act 1948 came under granite units among these units 22 are Large and Medium Scale Industries in Prakasam District during 2012-13.Vast resources of granite are making all out efforts to exploit and optimize granite production establishment of small-scale industries and undertake value addition. Granite industry has identified in small scale sector as one of the growth engines for overall development of industry and infrastructure in Prakasam district. Large and Medium Scale Industries in Prakasam district is shown in the table 1.

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RELIABILITY SYSTEMPREDICTION MODEL WITH NON-LINEAR OPTIMIZATION

DR. DHANANJAYA REDDY

Abstract: This paper presents reliability system prediction technique based on the evidential reasoning (ER) algorithm is developed and applied to forecast reliability in turbocharger engine systems. The focus of this study is to examine the feasibility and validity of the ER algorithm in systems reliability prediction by comparing it with some existing approaches. To determine the parameters of the proposed model accurately, some nonlinear optimization models are investigated to search for the optimal parameters of forecasting model by minimizing the mean square error (MSE) criterion. The experimental results show that the prediction performance of the ER-based prediction model outperforms several existing methods in terms of prediction accuracy or speed.

Keywords: evidential reasoning, reliability system, prediction, nonlinear optimization.

Introduction: System reliability can be defined as the probability that system will perform its intended function for a specific period of time under stated conditions [2]. The safe and reliable operation of technical systems is of great significance for the protection of human life and health, the environment, and the economy in general. The correct functioning of those systems also has a profound impact on production cost and product quality. The early detection of faults is critical in avoiding performance degradation and damage to machinery or human life.Focusing on safety, reliability analysis aims at the quantification of the probability of failure of the system [10].An accurate system or product reliability prediction model not only can learn and track the reliability and operational performance, but also offer useful information for managers to take follow-up actions to improve the quality and cost of system [7].Different reliability models were proposed to estimate and predict the reliability [1]. Fundamental issue in reliability analysis based on the failure data is the uncertainty in the failure occurrence and consequence [8, 10].

The evidential reasoning (ER) algorithm has been developed by Yang et al. for multiple attribute decision analysis (MADA) under uncertainty [4,6].This approach is developed on the basis of decision theory.The ER algorithm is developed to model the belief distribution structure [4, 5, 6, 8].

At present, many prediction mechanisms and mathematical models have been proposed to accomplish reliability prediction by a large community of researchers. The existing prediction methods can be roughly classified into three categories. They are; (a)Model-based methods (b)Time series analysis (c)Machines learning.

Evidential Reasoning Algorithm: Consider L basic attributes e_i(i=1...L) associated with system reliability state y. Define a set of L basic attributes as evidence source as follows:

$E = \{ e_1, \ldots . e_L \}$ (1)

Consider the weights of the attributes are W $=\{w_1, \ldots | w_i, \ldots w_L\}$,where w_i is the relative weight of the ith basic attributinge$_i$, and the weights of the attributes are normalized to satisfy the following constraints:

$0 \leq w_i \leq 1$ and $\sum_{i=1}^{L} w_i = 1$ (2)

Define N distinctive reliability state evaluation grades as represented by $F = \{ F_1, .. F_n, \ldots F_N \}$ (3)

Where Fn is the nth reliability state of evaluation grade.

Mathematically, for a given assessment e_i (i= 1...L) represented as the following distribution

$S(e_i) = \{(F_n, |\beta_{n,i}), n = 1, \ldots N\}$, i= 1,...L (4)

Where $\beta_{n,i} \geq 0$,$\sum_{n=1}^{N} \beta_{n,i} \leq 1$ and $\beta_{n,i}$denotes a degree of belief.

Let $m_{n,i}$be a basic probability mass representing the degree to which the ith basic attribute $e_i$supports the hypothesis that the system reliability state is assessed to the nth grade.

$m_{n,i} = w_i \beta_{n,i,}$ n= 1... N, i=1...L (5)

$m_{F,i} = 1 - \sum_{n-}^{N} m_{n,i} = 1 - W_i \sum_{n-1}^{N} \beta_{n,i}$, i= 1... L (6)

$\mu_{F,i} = 1 - W_i$, i=1 ... L (7)

$\lambda_{F,i} = W_i (1 - \sum_{i=1}^{n} \beta_{n,i})$, i=1... L (8)

$m_{F,i} = \mu_{F,i} n + \lambda_{F,i}$ (9)

$\{F_n\}:m_n = K_L[\prod_{i=1}^{L}(m_{n,i}+\mu_{F,i}+\lambda_{F,i}) - \prod_{i=1}^{L}(\mu_{F,i}+\lambda_{F,i})]$ (10)

$\{F_n\}:\mu_{F,i} = K_L[\prod_{i=1}^{L}\mu_{F,i}+\lambda_{F,i}) - \prod_{i=1}^{L}(\mu_{F,i})]$ (11)

$\{F_n\}:\lambda_{F,i} = K_L\prod_{i=1}^{L}(\mu_{F,i})$, n= 1... N (12)

With

$K_L = [\sum_{n=1}^{N}\prod_{i=1}^{L}(m_{n,i}+\mu_{F,i}+\lambda_{F,i}) - (N-1)\prod_{i=1}^{L}(\mu_{F,i}+\lambda_{F,i})]^{-1}$ (13)

The combined probability assignments are normalized into overall belief degrees by using the following equations

$\{F_n\}:\beta_n = m_n / 1-\lambda_F$ (14)

$\{F_n\}:\beta_F = \mu_F / 1-\lambda_F$ (15)

β_n and $\beta_F$represent the belief degrees of the aggregated assessment to which the general attribute is assessed to the grades $F_n$and F respectively.

The combined assessment can be denoted by$S(y) = \{F_n, \beta_n), n = 1, \dots, N\}$ It provides a panoramic view about the assessment state of system reliability, from which one can tell which grades the system reliability is assessed to, and what belief degrees are assigned to the defined reliability assessment grades.

The analytical ER algorithm (10)–(15) offer the ER algorithm flexibility in aggregating a large number of basic attributes. Inheriting the nonlinear features of the original ER approach, the analytical ER algorithm clearly shows nonlinear features and provides a straight forward way to conduct sensitivity analysis for the parameters of the ER algorithm such as attributes weights. It also facilitates the estimation and optimization of these parameters.

Reliability Prediction Model Based On The Er Algorithm: A reliability prediction model is investigated in the ER framework. It is assumed that a set of observed data is provided in the form of input–output pairs $(X(t_m)$, $(y(t_m))$, m= 1,...,M, with $X(t_m)$being an input vector of the actual system at time t_m and $y(t_m)$ being a scalar representing the corresponding output value or subjective distribution value of the actual system at timet_m.

The general reliability prediction model can be represented as

$\hat{y}$ (t+k-1) = f ($y_{t-1}, y_{t-2,\dots}, y_{t-p}$) (16)

Where $\hat{y}$ (t+k-1) is a scalar representing the predicted future value at time t+k-1, ($y_{t-1}, y_{t-2,\dots}, y_{t-p}$) is a vector of lagged variables, and p represents the dimensions of the input vector (number of input nodes) or the number of past inputs related to the future value.

Let $X(t)$ = ($y_{t-1}, y_{t-2,\dots}, y_{t-p}$) denote the input vector of the prediction model can each be represented using the following belief structure:

$S(y_{t-1})$ = { $F_n, \beta_{n,i}(y_{t-1})$), n= 1,..., N}, i= 1,..., p(17)

Having represented each attribute as (17), the ER approach can be directly applied to combine all attributes and generate final conclusions.Using the ER analytical algorithm (5)–(15), the final prediction result

$O(\hat{y}$ (t)) = {$(F_n, \beta_n(t))$,(F,β_F(t)), n=1,2,...N } (18)

Where, $\beta_n(t)$ can be obtained by the analytical ER algorithm.

In order to give a reasonable interpretation of the predicted results in the ER based prediction model by using Lemmas.

Lemma 1: The probabilistic representation of belief is the only appropriate representation of belief which acts correctly under combination [3].

Lemma 2: In the ER approach, the Dempster's combination rule is adopted, and the aggregated beliefs generated by combining multiple pieces of evidence in the ER approach are also represented as probability [9].

Lemma 3: The probabilistic representation of belief defined on the power set F is the only appropriate representation of belief which acts correctly for evidence combination in the ER approach[9].

Based on Lemmas 1–3, Theorem is given below.

Theorem1: According to (18), in the ER-based prediction model, the predicted output can be represented as$O(\hat{y}$ (t)) = {$(F_n, \beta_n(t))$,(F,β_F(t)), n=1,2,...N }. If, β_F(t))=0 , then the belief distribution$O(\hat{y}$ (t)) can be interpreted as a probabilistic distribution function.

Optimal Learning Algorithm For Training The Er-Based Prediction Model: In the ER framework, based on the optimization, the attributes weights and expected utilities of the ER-based prediction model are determined optimally and simultaneously**.**Several learning models are designed to adjust the parameters in order to minimize the difference between the observed output $y(t)$and the simulated output$\hat{y}$(t). such an optimally trained ER based model may then be used to predict the behavior of the system.The optimal learning problem can be represented as the following nonlinear programming problem:

Min $f(p)$ such that A(P) =0, $B(P) > 0$

The output that is shown in (18) is represented as a distribution, and its average utility is given by

$\hat{y}(t) = \sum_{n-1}^{N} \beta_n (t) u(F_n) + [u(F_1) + u(F_N)]/2 \, \beta_F (t)$ (19)

Where ($\hat{y}$ (t) is considered to be the predicted output at time t from the ER-based prediction model.

The optimization model is constructed to minimize the mean square error (MSE) criterion

$MinJ = \frac{1}{M} \sum_{i=1}^{M} (y(t_i) - \hat{y}(t_i))^2$ (20)

Where

$(y(t_i)$denotes the actual output data of a system at timet_i and$\hat{y}(t_i)$denotes the predicted output data of the system at timet_i from the ER-based prediction model.

Conclusions: The accurate and effective system reliability prediction model can not only learn and track a system or product's reliability and operational performance, but also offer useful information for managers to take follow-up actions timely to improve the performance of the system. In this paper, a novel reliability prediction technique is developed and applied to forecast reliability in turbochargers engine systems. The reliability prediction technique that can be used to predict the reliability of turbochargers engine systems has been developed, tested, and validated. The new method that is discussed is based on the ER algorithm.

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PARADIGM SHIFT AND LATERAL THINKING- TWIN BLESSINGS

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Abstract

Education is the most important invention of mankind in the world. It is a panacea to all Social, Economic and Political problems and also a boon to progress to the development of mankind. Hence education is precious and also pious. In modern times also, education is a great irresistible force, which has taken the entire world in its fold. Education is an activity or a process, which transforms the behaviour of a person from `instinctive behaviour' to `human behaviour'. Man instead of acting impulsively, acts rationally.

Objectives of the Study:

1. To explain the Education system in Ancient, Medieval and Modern India
2. To identify the necessity of Paradigm Shift and Lateral Thinking.

In ancient India, education was identified as a means to rediscover one's own potential in a spiritual dimension. It was aptly defined as the way to manifestation of perfection that is already present in man. According to Swami Vivekananda, "Education is the manifestation of the perfection already in man"[i].In ancient India, education is considered as the third eye of a person. It gives him insight into all affairs. Education nourishes us like a mother, it directs us to the proper path like the father and it guides us to reach our destination like a teacher.

India was a centre of education and learning for the entire world. Many life skills were taught in ancient Indian universities like ***Nalanda*** and ***Taksila***. Teacher and taught used to maintain eternal and unconditional relationship and tried to explore both material and spiritual worlds with equal intensity. Education was not identified with instruction then and it was not guided by materialistic ambitions. There were many schools in arts and sciences in ancient universities and all schools were treated with equal priority. Fine arts were also taught to deserving and aspiring candidates. Vocational training was a part and parcel of curriculum in those days so that the inmate of a ***gurukulam*** was trained with all life skills as an integral part of schooling.

In ancient times, India had the ***Guru Kula*** system of education in which anyone who wished to study went to a teacher's (Guru) house and requested to be taught. If accepted as a student by the guru, he would then stay at the guru's place and help in all activities at home. This not only created a strong tie between the teacher and the student, but also taught the student everything about running a house. The guru taught everything the child wanted to learn, from Sanskrit to the Holy Scriptures and from Mathematics to Metaphysics. The student stayed as long as he or she wished or until the guru felt that he had taught everything he could teach. All learning was closely linked to nature and to life, and not confined to memorizing some information. All the religions of the world were being taught with equal fervour and austerity so that the disciples used to develop religious and cultural harmony effortlessly. The ancient system of education was totally free from the influence of market forces. Disciples were not considered as goods required for market in those days. All the disciples were free to choose their subjects depending on their core potential. This catalysed the natural growth of talent in a taught and learning was never considered as a burden in those days. Commercial element was unknown in that system of education.

The social structure existing in olden days was so flexible that it accommodated all the individuals in its set up and it also facilitated the easy movement of talent both vertically and horizontally. Ancient Indian education system used to mould the students in such a manner that they became experts in **arts of living, giving and loving.**Instruction in those days was not conditioned by **commercial needs**. They tried to inculcate the spirit of environmentalism in students as a result plundering of natural resources was unknown in the past. Nature was

respected and even its fury was accepted by Indians. Engineering technology was also taught but it was never misused to construct dams that changed the natural meandering path of rivers. Instead, it was used to erect the marvellous temple towers and gate ways. Thus the spirit of humanism was accorded top priority in ancient Indian curriculum. Literature was taught with greater dedication and devotion so that the learners could develop romanticism and aesthetic sense in equal proportions and these twin qualities enabled them to accommodate themselves in society after the completion of their course. Ancient Indian education system created many engineering marvels that belong to different cultures. **Cultural exchange** and **resynthesis** were very common in those days and this facilitated the expansion of horizons of knowledge and technology along with cultural harmony among different nations.

Before admitting a taught in a particular school, their attitude and aptitude were tested with greater precision and there was no need for paradigm shift in ancient system of education as the erstwhile society had the immense potential to accommodate the scholars belonging to any school. Psychological training was also imparted to students as a part of schooling so that the taught could develop an acceptable social behaviour. Chronic and acute unemployment was unknown in those days as the society had equal regard for technology and fine arts. Technology was used to manifest the beauty of nature in its infinite proportions in those days rather than exploiting the same. Education was not a burden in those days as it was available to the deserved free of cost. Thus education in ancient India always served the needs of then existing society.

Education in medieval India was imparted in different types of educational institutions based on the needs and potential of each student. From about 1000 A.D. to 1700 A.D. education in India underwent a radical change. The *Ayats*, Koran and the *Hadiths* of the Prophet dominated in the new context. '*Maktabs*' or elementary schools were generally attached to the mosques and the type of education imparted in those schools was a blend of religious and secular instruction"[ii] *Madarsas* were schools for higher learning; those too were attached to mosques.

The Muslim rulers bestowed their attention towards education after the consolidation of their power firmly established in different parts of the country. In the

words of S.N. Mukherjee, "The whole educational system was saturated with religious ideals which influenced the aim, the contents of study, and even the daily life of the pupils." The pupils acquired knowledge as a religious obligation.[iii]

A notable feature of the Muslim education in India was that it was centred mainly in the towns and cities. In this respect it was in contrast to the ***Brahmanical*** education, which was mainly centred in places far away from the din and bustle of city life.Muslim education during the medieval period was not only patronized and subsidized by the state but was also guided and controlled by it[iv].On the other hand it can be noted that in the Vedic and Buddhist systems of education it was exclusively private affair.

With the advent of British, the system and curriculum of Indian education underwent disproportionate changes. They introduced clerk making education in place of character making education. Lord McCauley deformed the traditional values of Indian education. Brain drain and economic drain were triggered by this new system. Urban migration became a common phenomenon and rural areas were voluntarily evacuated by people in search of livelihood. Indian history was recorded by foreign historians according to their whims and fancies in order to undermine the greatness of Indian culture. Commercial element crept into the system of education. In a market economy some goods and services can be bought and sold in competitive markets and without substantial government involvement buyers and sellers interact in ways that produce desirable results. In fact buyers of these commodities weigh up the benefits and compare them to the costs when they make a decision to purchase. English language was imposed on Indian youth and this tarnished the glory of many native Indian languages. To check the negative impact of this modern education, many freedom fighters established national schools but they failed to attract the elite of the society.

Even after independence, Indian administrators continued the legacy of British in education as it perpetuates the power and official secrecy of Government. Education in India falls under the control of both the Union Government and the states, with some responsibilities lying with the Union and the states having autonomy for others. The various Articles of the Indian Constitution provide for education as a fundamentalright to the people of India, a responsibility of the State and Parents. After Liberalization, Privatization and Globalization Policy was adopted in 1991. India's improved education system is often cited as one of the main contributors to the

economic rise of India. Much of the progress in education has been credited to various private institutions. "The private education market in India is estimated to be worth $40 billion in 2008 and will increase to $68 billion by 2012"[v]. While Primary Education is a basic enabling factor for participation and freedom, for trading a life with dignity and overcoming basic deprivation, secondary education is the gateway for prosperity, for transforming the economy and establishing social justice in any country. It opens the world of work to the youth of the country and contributes to socio economic development of the Community. Secondary Education is a crucial stage in the educational hierarchy as it prepares the students for higher education and also the world of work.

With the liberalization and globalization of the Indian economy, the rapid changes witnessed in scientific and technological world and the general need to improve the quality of life and to reduce poverty, it is essential that schools' leavers acquire a higher level of knowledge and skills than what they are provided in the eight years of elementary education, particularly when the average earning of a secondary school certificate holder is significantly higher than that of a person who has studied only up to class VIII. The policy at present is to make secondary education of good quality available, accessible and affordable to all young persons in the age group of 14-18.[vi]".However after independence it was natural for secondary education and the higher education to grow. Many of new universities were opened and the students receiving education in them also increased. This added to knowledge economy considerably. In view of the changed Political and Social conditions prevalent in India, this aim was bitterly criticized and a demand was made for the reorganization of university education in accordance with the needs of the country.

National Knowledge Commission is an Indian think-tank charged with considering possible policies that might sharpen India's comparative advantage in the knowledge-intensive service sectors. It was constituted on 13 June 2005, by the Prime Minister of India, Dr. Manmohan Singh.

In particular, the Commission was to advise the Prime Minister's Office on policy related to education, research institutes and reforms needed to make India competitive in the knowledge economy. The Commission was to recommend reform of the education sector, research labs, and intellectual property legislation; as well as

consider whether the Government could itself upgrade its use of the latest techniques to make its workings more transparent.[vii]

The National Knowledge Commission is a high-level advisory body to the Prime Minister of India, with the objective of transforming India into a Knowledge Society. In its endeavour to transform the knowledge landscape of the country, the National Knowledge Commission has submitted around 300 recommendations on 27-focus areas during its three and a half year term.[viii]

In this 21st century dynamic world, what was considered quality education yesterday might not meet the needs of today and tomorrow. Therefore, every new generation must learn how to lead a balanced existence, preserving the traditions by adopting the new changes in the society. Quality of education facilitates 'rights-based approach' to all educational endeavours. Education is a human right, and therefore quality of education supports all of the human rights. Values such as democracy, socialism, secularism, justice, liberty, equality, fraternity and human rights must be understood as fundamentals for quality education. According to UNESCO 1996 the four pillars of learning must support the quality of education: learning to know, learning to do, and learning to live together.[ix]

CHANGING EDUCATIONAL PROFILE AS A CONSEQUENCE OF GLOBALIZATION

In recent times the number of higher educational institutions has grown exotically. In our country the number has increased from 20 to 677 Universities from 1950 to 2014. In the present day educational scenario the number of colleges has increased from 500 to 37204[x.] India has been recognized as intellectual capital of the world. While this is a cause for euphoria and celebration, it is equally a cause for concern and reflection. Though we produce large number of graduates, in those half of them are unemployed. It seems that quality has to keep pace with quantity and quality of consciousness does not come only with investment of funds and human resources but by awakening of consciousness. Quality of consciousness, resource mobilization through public private partnership and its proper management are the keys to qualitative higher education. Our curriculum is woefully out dated and needs revamping with special emphasis on skill development and research. Among the other things that need to be changed are teachers capable of facing the challenges of global competition and better monitoring of higher education institutions. To attain and sustain national, regional and international quality, higher education

institutions should adopt forward looking educational practices that respond to the needs of the environment. India cannot be a knowledge superpower as it aspires to be unless we go for innovations, diversification and expansion and quality enhancement.

Quality in higher education is a multidimensional concept, embracing all the functions and activities and requires to be characterized by international dimensions while taking into account national cultural values and circumstances. The issue of quality is an elusive one; everyone seems to understand it but few are able to articulate it. One is relevant for assessing the quality of education as a service and the other for assessing the implications of education for quality in life. The terms of quality have several meanings. Quality in education is viewed as measuring against the norm standard or specification of educational standard. Quality as accepted by educationists is transformational value system. It means specifying worthwhile learning goals and enabling students to achieve them.

The touch stone of higher education system is to inculcate quality and improve every moment with respect to new developments in the field of Higher Education with accreditation becoming a national and international norm India needs to gear itself to academic innovations, establishing new benchmarks for quality. The phenomenon of globalization and liberalization has made both the public and the government agencies to be quality conscious and as a result have established credible accreditation. The NAAC has been created by UGC to ensure standards in quality assessment in education.

Advent of information technology revolutionised the fields of science and traditional courses in the present era have almost lost their charm. Information technology led to the corporatization of education and as a result it has become much costlier. Every year thousands of students are enrolled in colleges and Universities having attained their targeted academic qualification most of them seek admission in Professional courses in order to get an early job. Learning has become a pressure instead of pleasure. Education has become identical to affluence and this has triggered a rat race in the youth. The problem with rat race is even if we win we are still rats.

Computer education is alone regarded as education now a days. Use and throw technology has been strengthened due to this new system of education. Students are also regarded as market commodities. Different courses in colleges are

designed by corporate companies and industries in order to cater to the needs of market. All these revolutionary changes in the field of education have created unusual stress on the youth. This stress was piled up due to collapse of composite families. Modern education created a concept of "me only" in the youth leading to collapse of composite families.

As the market is always dynamic and its needs keep changing with time, the youth world over is subject to unusual stress throughout their life. The knowledge they have learnt during their schooling suddenly becomes inappropriate and unsuitable for the market. This reduces the chances of employment. This moral crisis and bankruptcy in present day students can be resolved only by the twin concepts of **paradigm shift and lateral thinking**.

This concept of **paradigm shift** has found its relevance in all spheres of knowledge. Wisdom is defined as the capacity to change knowledge patterns so that the student will have the knowledge to acknowledge the changes that happen in the society. This sharpens the intelligence of taught lest he becomes outdated in changing scenario.

Lateral thinking is another new concept and this is also known as out of box thinking. It is creative thinking or innovative thinking. Using the present resources to the full potential is the core concept of this thinking. Both paradigm shift and lateral thinking enable the present day students to upgrade their skills eternally to suit to the ever changing market needs. These two techniques also teach crisis management skills to future students so that lack of opportunities will not frustrate them. Thus modern education will be strengthened by adapting these twin concepts of paradigm shift and lateral thinking as parts of curriculum so that the internal quality of both student and system will be maintained at higher levels.

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SYMMETRIC *n*-DERIVATIONS ON PRIME AND SEMIPRIME COMMUTATIVE RINGS

DR. DHANANJAYA REDDY

Abstract: Let n ≥2 be a fixed positive integer and let R be a non-commutative n!-torsion free semi prime ring. Suppose that there exists a symmetric n-derivation $\Phi : \mathcal{R}^n \longrightarrow \mathcal{R}$ such that the trace of Φ is centralizing on R. Implies the trace is commuting on R. If R is an n!-torsion free prime ring and $\Phi \neq 0$ under the same condition. Implies $\mathcal{R}$is commutative.

Keywords: associative ring, additive map, commutative ring, semi prime ring, symmetric derivation.

Introduction And Preliminaries: Consider $\mathcal{R}$ represents an associative ring and Z its center. Let x; y; z ∈ R. Take the notation [y,x] for the commutate yx - xy with identities [xy; z] = [x; z]y + x[y; z] and [x,yz] = [x,y]z+y[x, z]. R is semi prime if aRa= 0 ⇒a = 0 and R is prime if aRb = 0 ⇒a = 0 or b = 0. A map f:R ⟶ R is said to be commuting on R if [f(x); x] = 0 ∀x ∈R. A map f:R ⟼ R is centralizing on R if [f(x); x] ∈ Z is fulfilled ∀x ∈R. An additive map D:R ⟶ R is called a derivation if the Leibniz rule D(xy) = D(x)y + xD(y) holds ∀x, y ∈ R. Let n ≥2 be a fixed positive integer and R^n= R ×R × .... ×R. A map $\Phi : \mathcal{R}^n \longrightarrow \mathcal{R}$is said to be symmetric if the equation $\Phi(x_1, x_2 \ldots x_n) = \Phi(x\pi_{(1)}, x\pi_{(2)} \ldots x\pi_{(n)})$ holds $\forall x_i \in R$ and for every permutation $\{\pi(1), \pi(2), \ldots \pi(n)\}$.

Let n ≥2 be a fixed positive integer. An n-additive map $\Phi : \mathcal{R}^n \longrightarrow \mathcal{R}$will be called an n-derivation if the relations

$\Phi(x_1x_1', x_2, \ldots x_n) = \Phi(x_1, x_2, \ldots \boldsymbol{x_n})x_1' + x_1\Phi(x_1', x_2, \ldots x_n)$

$\Phi(x_1, x_2x_2' \ldots x_n) = \Phi(x_1, x_2, \ldots \boldsymbol{x_n})x_2' + x_2\Phi(x_1, x_2', \ldots x_n)$

.....

$\Phi(x_1, x_2 \ldots x_nx_n') = \Phi(x_1, x_2, \ldots x_n)x_n' + x_n\Phi(x_1, x_2, \ldots x_n')$ are valid $\forall x_i, x_i' \in \mathcal{R}$.

Φ Is a symmetric bi-derivation on non-commutative 2-torsion free prime rings, M. Bresar [1, Theorem 3.5] proved that Φ = 0.

Let n ≥2 be a fixed positive integer. If R is commutative, then a map$\Phi : \mathcal{R}^n \longrightarrow \mathcal{R}$ defined by $(x_1, x_2, \ldots x_n) \longmapsto D(x_1)\, D(x_2) \ldots D(x_n)$ $\forall x_i \in \mathcal{R}$, i = 1, 2... n is a symmetric n-derivation, where D is a derivation on$\mathcal{R}$.

Let $\mathcal{R} = \left\{ \begin{pmatrix} a & b \\ 0 & 0 \end{pmatrix} / a, b \in \mathbb{C} \right\}$;

Where $\mathbb{C}$ is a Complex field. Clearly R is a non-commutative ring under matrix addition and matrix multiplication. And a map $\Phi : \mathcal{R}^n \longrightarrow \mathcal{R}$is a symmetric *n*-derivation.

Let n ≥2 be a fixed positive integer and let a map φ: R ⟶ R defined by $\varphi(x) = \Phi(x_1, x_2, \ldots x_n) \forall x \in R$, where $\Phi : R^n \dashrightarrow R$ is a symmetric map, be the trace of Φ It is obvious that, in case when φ: R ⟶ R is a symmetric map which is also n-additive, the trace φ of Φ satisfies the relation.

$$\varphi(x + y) = \varphi(x) + \varphi(y) + \sum_{k=1}^{n-1} \binom{n}{k} x^{n-k}y^k \ , \forall\ x, y \in R$$

A study on the theory of centralizing commuting maps on prime rings was initiated by the classical result of E.C. Posner [5] which states that the existence of a nonzero centralizing derivation on a prime ring *R* whichis commutative. The study of centralizing commuting maps, J. Vukman [6, 7] investigated symmetric bi-derivations on prime and semi prime rings. Also obtained the similar results to Posner's and Vukman's ones for permuting 3-derivations on prime and semi prime rings [3]. This paper is to apply the result due to E.C. Posner [5, Theorem 2] to symmetric *n*-derivations.

2. Some Results:

Precede the proof of the results by two well known lemmas.

Lemma 2.1 : Let R be a prime ring. Let$\mathcal{D}: \mathcal{R} \longrightarrow \mathcal{R}$ be a derivation and a∈ $\mathcal{R}$. If a$\mathcal{D}$(x) = 0 holds ∀x ∈ $\mathcal{R}$ then we have either *a* = 0 *or* $\mathcal{D}$= 0 ([4]).

Lemma 2.2: Let n be a fixed positive integer and let R be a n!-torsion free ring. Suppose that $y_1, y_2, \ldots y_n \in \mathcal{R}$ which satisfy $\lambda y_1 + \lambda^2 y_2 + \ldots + \lambda^n y_n$ for λ=1,2,...n. ⇒ y_i =0, ∀ i([2]).

Theorem 2.3: Let n ≥2 be a fixed positive integer and let $\mathcal{R}$be a non-commutative n!-torsion free prime ring. Suppose that there exists a symmetric n-derivationΦ: $\mathcal{R}^n \longrightarrow \mathcal{R}$ such that the trace φ of Φ is commuting on$\mathcal{R}$. Then we have Φ = 0.

Proof: Suppose that $[\delta(x), x] = 0\ \forall\ x \in \mathcal{R}$ (1)

Let $\lambda (1 \leq \lambda \leq n)$ be any integer.Substituting x+λy for x in (1) we have

$\lambda\{[\delta(x), y] + C_1^n[h_1(x;y), x]\} + \lambda^2\{C_1^n[h_1(x;y), y] + C_2^n[h_2(x;y), x]\} + \ldots + \lambda^n\{[\delta(y), x] + C_{n-1}^n[h_{n-1}(x;y), y]\} = 0\ \forall x, y \in \mathcal{R}$ **(2)**

From Lemma 2.2 and (2), we get,

$[\delta(x), y] + n[h_1(x;y), x] = 0 \quad \forall\ x, y \in \mathcal{R}$ **(3)**

Put xy=y in (3) we have

$[\delta(x), xy] + n[h_1(x; xy), x] = 0$

$\Rightarrow x\{[\delta(x), y] + n[h_1(x;y), x]\} + n\delta(x)[y, x] = 0$

$\Rightarrow n\delta(x)[y, x] = 0 = (x)[y, x]$, ∀ x, y ∈ $\boldsymbol{\mathcal{R}}$ **(4)**

⇒ $\delta(x) = 0$ (From (4) and Lemma 2.1),∀ x ∈ $\mathcal{R}$ (x≠ Z)

Let $x \in \boldsymbol{\mathcal{R}}$(x = Z)and $y \in \mathcal{R}$ ($y \neq Z$) ⇒ $\boldsymbol{y + \lambda x \notin Z}$

∴ $\delta(y + \lambda x) = 0$

$$\Rightarrow \delta(y) + \lambda^n\delta(x) + \sum_{k=0}^{n-1} \lambda^k \binom{n}{k} h_k(y; x) = 0$$

$\sum_{k=0}^{n-1} \lambda^k \binom{n}{k} h_k(y;x) + \lambda^n \delta(x) = 0$
$\forall x,y \in \mathcal{R}$ **(5)**
$\Rightarrow \boldsymbol{\delta(x)} = 0$ (By applying (5) in Lemma2.2) $\forall x \in \mathcal{R}$ $(x \in Z)$
Now, let $P_k(x) = \Phi(x,x,\ldots k \text{ times }, x_{k+1}, x_{k+2}, \ldots x_n)$ for k=1,2,...n and for x, $x_i \in R$,
i= k+1, k+2...n
Let $\mu \in Z$ such that $(1 \leq \mu \leq n-1)$
$\therefore \delta(\mu x + x_n) = 0$
$\Rightarrow P_n(\mu x + x_n) = 0$
$\Rightarrow \mu^n \delta(x) + \delta(x_n) + \sum_{k=1}^{n-1} \mu^k \binom{n}{k} P_k(x) = 0$
$\Longrightarrow \sum_{k=1}^{n-1} \mu^k \binom{n}{k} P_k(x) = 0$ true $\forall x, x_n \in R$ (6)
∴From Lemma 2.1 and (6) we have
$C_{n-1}^n P_{n-1}(x) = 0 = P_{n-1} \forall x \in R$ (7)
Let ν $(1 \leq \nu \leq n-1)$ be any integer.
From (7), $P_{n-1}(\nu x + x_{n-1}) = 0$
$\Rightarrow \nu^{n-1} P_{n-1}(x) + P_{n-1}(x_{n-1}) + \sum_{k=1}^{n-1} \nu^k \binom{n}{k} P_k(x) = 0$
$,\forall x, x_{n-1} \in R$
$\Rightarrow \sum_{k=1}^{n-1} \nu^k \binom{n}{k} P_k(x) = 0 \quad \forall x \in R$ (8)
Now, $C_{n-1}^n P_{n-2}(x) = 0 = P_{n-2}(x)$,$\forall x \in R$ (By (8) and Lemma 2.1)
By proceed above we get finally $C_1^n P_1(x) = 0 = P_1(x)$, $\forall x \in R$
$\Rightarrow \Phi(x_1, x_2, \ldots x_n) = 0 \quad \forall x_i \in R$
Hence the Proof.

Lemma 2.4: Let n be a fixed positive integer and let R be a n!-torsion free ring. Let $y_1, y_2, \ldots, y_n \in R$ satisfy $\lambda y_1 + \lambda^2 y_2 + \ldots + \lambda^n y_n \in Z \forall \lambda = 1,2,\ldots n$. Then $y_i \in Z \forall i$

Theorem 2.5: Let n ≥2 be a fixed positive integer and let R be a non-commutative n!-torsion free semi prime ring. Suppose that there exists a symmetric n-derivation $\Phi: \mathcal{R}^n \longrightarrow \mathcal{R}$ such that the trace φ of Φis centralizing on R. Then φ is commute on R.

Proof:
Assume that $[\varphi(x), x] \in Z, \forall x \in \mathcal{R}$ (9)
Let λ $(1 \leq \lambda \leq n)$ be any positive integer. Put x= x+ λy in (9) we get
$\boldsymbol{Z} \ni \lambda\{[\varphi(x), y] + C_1^n[h_1(x;y), x]\} + \lambda^2\{C_1^n[h_1(x;y),y] + C_2^n[h_2(x;y),x]\} + \ldots + \lambda^n\{[\varphi(y),x] + C_{n-1}^n[h_{n-1}(x;y),y]\}$,$\forall x, y \in \mathcal{R}$ (10)
$\Rightarrow [\varphi(x), y] + n[h_1(x;y), x] \in Z$ (∵ Lemma 2.4 and (10)) $\forall x, y \in \mathcal{R}$ **(11)**
Put $y = x^2$ in (11), we can show that
$[\varphi(x), x^2] + n[h_1(x;x^2), x] = (2n+2)[\varphi(x), x]x$, $\forall x \in \mathcal{R}$ (12)
Commuting with $\varphi(x)$ in (12) we get $(2n+2)[\varphi(x), x]^2 = 0, \forall x \in \mathcal{R}$ (13)
Further by substituting y = xy in (11) and on simplifying and reducing we get
$(2n+1)[\varphi(x), x]^2 = 0, \forall x \in \mathcal{R}$ (14)
Now from (13) and (14) we get relation $[\varphi(x), x]^2 = 0, \forall x \in \mathcal{R}$
$\Rightarrow [\varphi(x), x] = 0$, $\forall x \in \mathcal{R}$ (∵ the center of a semi prime ring contains no nonzero Nilpotent elements)
Therefore φ is commute on R.
Now, the main result, which is an analogue of Posner's theorem [5, Theorem 2], is as follows:

Theorem 2.6: Let n ≥2 be a fixed positive integer and let $\mathcal{R}$be an n!-torsion free prime ring. Suppose that there exists a nonzero symmetric n-derivation $\Phi: \mathcal{R}^n \longrightarrow \mathcal{R}$ such that the trace φ of Φ is centralizing on $\mathcal{R}$. Hence $\mathcal{R}$ is commutative.

Proof: Suppose that $\mathcal{R}$ is non-commutative. From the Theorem 2.5, φ is commuting on$\mathcal{R}$. By Theorem 2.3, Φ = 0 which is a contradiction.This gives the conclusion of the theorem.

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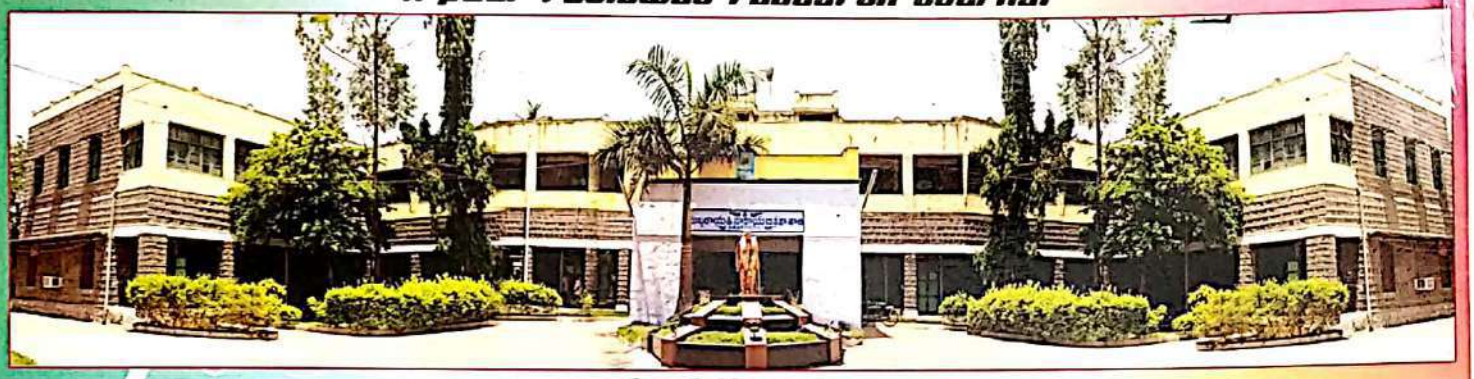

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on

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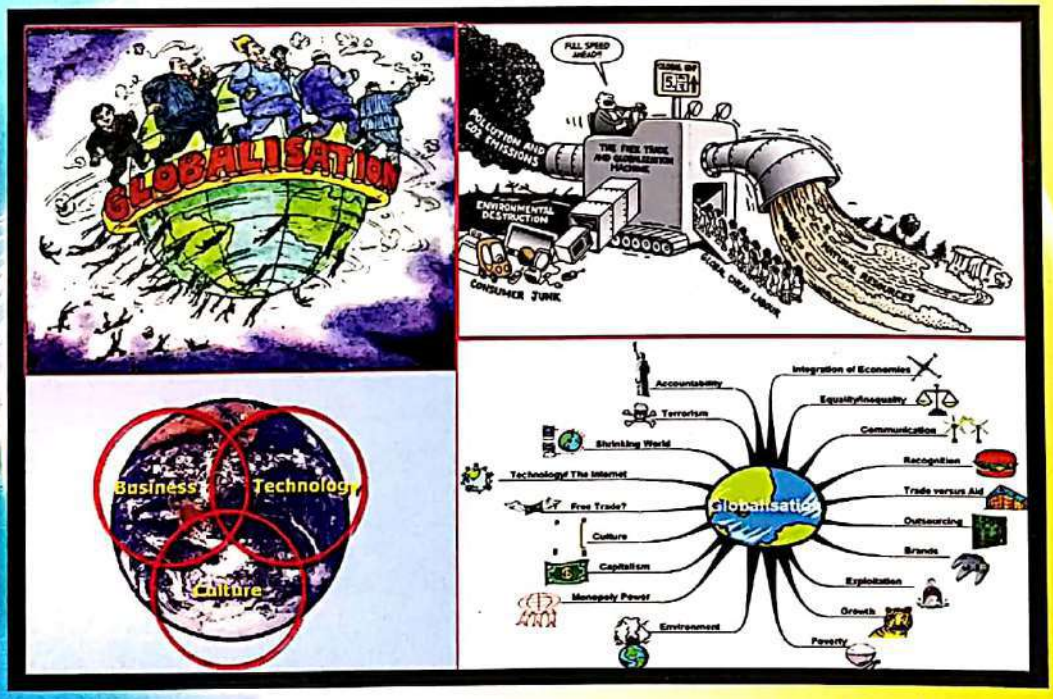

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IMPACT OF GLOBALIZATION ON THE ENVIRONMENT

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ABSTRACT

Globalization is altering the global environment. Globalization involves multiple and complex Sets of overlapping processes. Inevitably, there will be manifold and at times cross-cutting effects on the global environment. Some perceive the net ecological impact of globalization as positive, as a force of progress and better lives. It fosters economic growth and cooperative institutions, both necessary in the long run to manage the global environment. Others see the net impact as negative, as a force sinking the globe into a bog of ecological decay. It is accelerating the destructive process of too many people consuming too many natural resources without any concern for equality or justice. Both the pro- and anti-globalization camps present persuasive data and arguments.

The environment impacts the pace, direction and quality of globalization. At the very least, this happens because environmental resources provide the fuel for economic globalization, but also because our social and policy responses to global environmental challenges constrain and influence the context in which globalization happens.

Key Words: *Globalization, environment, global warming, Greenhouse effect.*

INTRODUCTION

Globalization's direct and indirect effects on the environment. The direct effects include emissions and environmental damage associated with the physical movement of goods between exporters and importers. This includes emissions from fossil fuel use, oil spills, and introductions of exotic species. At the same time, growth in trade and foreign direct investment has numerous indirect effects. These indirect effects are often classified as falling under one of three categories: the scale, composition and technique effects. Furthermore, global warming may well be one of the causes of the increase in the number of natural disasters such as Hurricanes, Tsunami, Storms and Floods in recent years.

Global warming and Green house effect: After 150 Years of Industrialization, Global warming-also called Climate Change-refers to the worldwide rise in temperatures as the result of "Greenhouse effect" , that is excessive retention of solar energy in the atmosphere due to an accumulation of certain gases, particularly CO_2. Today, the United States is responsible for around 20% of global GHG emissions.

The problems begin when human activities distort and accelerate the natural process by creating. More greenhouse gases in the atmosphere than are necessary to warm the planet to an ideal Temperature.

- **Burning natural gas, coal and oil** including gasoline for automobile engines raises the level of carbon dioxide in the atmosphere.
- **Some farming practices and land** use changes increase the levels of methane and nitrous oxide.
- **Many factories produce long** lasting industrial gases that do not occur naturally, yet Contribute significantly to the enhanced greenhouse effect and "global warming" that is Currently under way.

Deforestation:

Deforestation is an indirect but very significant cause of the greenhouse effect. Clearing and Logging reduces the volume of CO_2 that plants convert into oxygen. This translates into an equivalent increase in the volume of CO_2 in the atmosphere and thus adds to the greenhouse effect Deforestation is mainly due to the conversion of forests into agricultural land, especially in developing countries. The world lost 3% of its forests. Some 200 km^2 of forest land - twice

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The size of Paris – disappears each day. The impact of deforestation isn't only felt by nature itself, but also by people, in particular the most vulnerable. By 2060, drought could render 90 million hectares in sub-Saharan Africa sterile. Some 1.8 billion people could lack water in the next 70 years. Central Asia, northern China and the Andes are particularly at risk.

Impoverishing biodiversity: A large number of species have become extinct in recent decades. Again, the link between the extinction of some species and globalization is indirect. Add to this the fact that 20% to 30% of all living species could disappear if the mean global temperature were to rise by 3 °C. 20th-century human activity already left an indelible mark on the world's ecosystems.

According to the International Union for Conservation of Nature (IUCN), 22% of the world's mammals are threatened with extinction today, as well as 24% of the world's snake species, 31% of the world's amphibians and 35% of the world's birds. According to some estimates, the total damages to the ecosystem would result in an annual loss of USD 68 billion to the world economy. The World Wildlife Fund for Nature (WWF) predicts that by 2030, if nothing changes, humanity will exhaust annually twice the resources produced by the planet every year.

Population growth: Population growth is another factor in global warming, because as more people use fossil fuels for heat, transportation and manufacturing the level of greenhouse gases continues to increase. As more farming occurs to feed millions of new people, more greenhouse gases enter the atmosphere.

Surface Transport: Environmental damages arising from land transport vary considerably depending on, amongst other things, the density of the area through which traded goods are routed.

Shipping Related Emissions: For trade between countries that do not share a land border, the vast majority of goods are moved by ocean or air. Ton-miles transported by ship dominate shipments by air by a factor of 100.

Aviation: The global transport sector accounts for approximately 14% of anthropogenic greenhouse gas emissions. Of this 14%, freight trucks account for 23%, ships 10%, and international aviation 7%. Although aviation's direct greenhouse gas emissions are the smallest of the group, greenhouse gas emissions from aviation under-represent their actual contribution to climate change.

Uneven political efforts: For several decades, we've witnessed some degree of environmental awareness among political decision makers. It's partly up to national political decision makers to take pro-environmental measures to prevent or repair the environmental damage arising, in part, from globalization.

Globally co-ordinate actions have positive results: Awareness has grown in recent years, but is still not enough. It should be possible not only to reconcile globalization and conservation of the environment, but also to act so that globalization becomes a vector of green growth.

CONCLUSIONS

There's international consensus on the existence of global warming and its increase since the 1980s. Most scientists – especially those working in the Intergovernmental Panel on Climate Change (IPCC) – believe that increases in emissions of carbon dioxide (CO_2) from human activity are the primary cause of global warming.

The relationship between globalization and the environment is too complex to sum up in a single judgment – whether "good" or "bad". A sound environment is essential to realizing the full potential of globalization. Conversely, the absence of a sound environment can significantly undermine the promise of economic prosperity through globalization. Technological solutions will inevitably determine the future of globalization as well as the global environment. Technology cannot change the demands or help us satisfy all of them but it can, through globalization, help meet these demands a more planet-friendly way.

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SPECTROPHOTOMETRIC DETERMINATION OF BIFENOX AND IN ITS COMMERCIAL FORMULATIONS

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ABSTRACT
A simple, precise, rapid, sensitive and accurate spectrophotometric methods have been developed for the estimation of Bifenox in pure form and its formulations and Spiked vegetables and water samples. This method is based on oxidative coupling of Bifenox with MBTH in the presence of ferric chloride to form green coloured product with maximum of 615 nm. The product obeyed Beer's law in the concentration range 0.5-3 ml (5-30 µgml^{-1}) with molar absorptivity of 1.001x10^4. Sandells sensitivity 0.004945. The assay of results was found to be good agreement with label claim.

KEYWORDS: Bifenox, MBTH, UV/Vis., Spectrophotometry, validation.

INTRODUCTION
A survey of the literature revealed that different analytical techniques for the assay of MTM have been reported. Volta metric detection of the herbicide Bifenox at a bismuth film electrode in non-de aerated solution[1]. Electro analysis of Bifenox and metribuzen on lignin by adsorption[2] ,Electrochemical reduction of Bifenox[3], Identification of different products obtained by electrochemical and photochemical reduction of the Bifenox[4] . Volta metric determination of Bifenox with an electro generated molecularity imprinted polymer microsencer[5]. Electrochemical determination of the effect of lead (II) on the photochemical degradation of the pesticide Bifenox[6] .Volta metric determination of herbicide Bifenox using Mercury and silver solid amalgam electrode[7] Preconcentration and volta metric determination of the herbicide Bifenox with a silica modified carbon paste electrode[8]. Determination and method validation of Bifenox in soil by RP-HPLC[9] Electrochemical determination of the effect of Copper (II) on the photochemical degradation of the pesticide Bifenox[10] .

There is however no reported UV-Visible spectrophotometric method for the analysis of Mitamitron in its technical grade and formulations. This describes a validated ible spectrophotometric method for the quantitative determination of Mitamitron. Functional group used for color development of Mitamitron was primary amine group. The results obtained in this method was based on complex formation reaction of Mitamitron with oxidative coupling reaction with MBTH / ferric chloride.

The author has developed ible spectrophotometric method based on the use of method, without use of any interferences. An attempt has been made to develop and validate all methods to ensure their accuracy, precision, repeatability, reproducibility and other analytical method validation parameters as mentioned in the various guidelines.

This is describes a validated UV/Vis method for the quantitative determination of Bifenox. The empirical formula for Bifenox is $C_{10}H_{10}N_4O$ and the molecular weight is 342.128 g/mol . Bifenox has the following structure.

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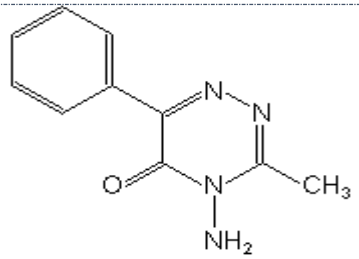

BIFENOX STRUCTURE

EXPERIMENTAL

Solvent

Methanol was used as a solvent in the present experiments.

1. Preparation of standard stock solution

Accurately weighed 100 mg of Bifenox was dissolved in 40 ml of methanol in 100 ml volumetric flask and volume was made up to the mark. i.e. 1000 µg ml^{-1} (stock solution A). From the above stock solution A 10 ml of solution was pipette out into 100 ml volumetric flask and the volume was made up to the mark with methanol obtain the final concentration of 100 µg ml^{-1}(stock solution B).

2. Preparation of calibration curve

Fresh aliquots of Bifenox ranging from 0.5 to 3 ml were transferred into a series of 10 ml volumetric flasks to provide final concentration range of 5 to 30 µg ml^{-1}.To each flask 1ml of (0.2%) MBTH solution was added followed by 1ml of (0.7%) ferric chloride solution and resulting solution was heated for 15 min and finally 1ml (0.5N) HCl solution was added. The solutions were cooled at room temperature and made up to mark with methanol. The absorbance of green colored chromogen was measured at 615 nm against the reagent blank. The color species was stable for 24 hrs. The amount of Bifenox present in the sample solution was computed from its calibration curve.

3. Procedure for formulations

Twenty tablets containing Bifenox were weighed and finely powdered. An accurately weighed portion of the powder equivalent to 100 mg of Bifenox was dissolved in a 100 ml of methanol and mixed for about 5 min and then filtered. The methanol was evaporated to dryness. The remaining portion of solution was diluted in a 100 ml volumetric flask to the volume with methanol up to 100 ml to get the stock solution A. 10 ml of aliquots was pipette out into 100 ml volumetric flask and the volume was made up to the mark with methanol to obtained the final concentration of 100 µg ml^{-1} (stock solution).

Subsequent dilutions of this solution were made with methanol to get concentration of 5 to 30 µg ml^{-1} and were prepared as above and analyzed at the selected wavelength, 615 nm and the results were statistically validated.

4. Recovery of Bifenox from spiked vegetables

100 gm of each vegetable (potatoes and tomatoes) were spiked with 200 ml chloroform for 5 min. The samples were fortified with different concentration of Bifenox in Methanol and blended for 3 min. Chloroform was filtered into 250ml Standard flask through whatmanNo.42 filter paper and the residue was retained. The residue was washed twice with 10 ml of chloroform and blended for 2 minutes. Chloroform extracts were combined and made up to the mark. Known aliquots of the chloroform extracts were used for colour development after evaporating chloroform on steam bath. The residue was dissolved in methanol and the amount was determined spectrophotometrically and the results were presented in tabulated in table 1.7.

5. Recovery of Bifenox from fortified water samples

After collection of the water samples (tap and distilled water minimum volume one litre) the pH of the water samples were adjusted below 4 with 20% sulphuric acid, then fortified with different concentrations of Bifenox dissolved in methanol. Extract each sample in a 250 ml separating funnel with 100 ml chloroform. The chloroform extract was transferred into a funnel and re extracted the aqueous phase twice with further 50 ml of chloroform. The second chloroform extracts was added to the first and washed the combined extract with 0.1 M K_2CO_3 then dried the chloroform by passing it through anhydrous sodium sulfate in a filter funnel and collected the extracts in a 250 ml flask. The chloroform extracts was reduced to 100 ml amount was determined spectrophotometrically. The results obtained were represented in table 1.8.

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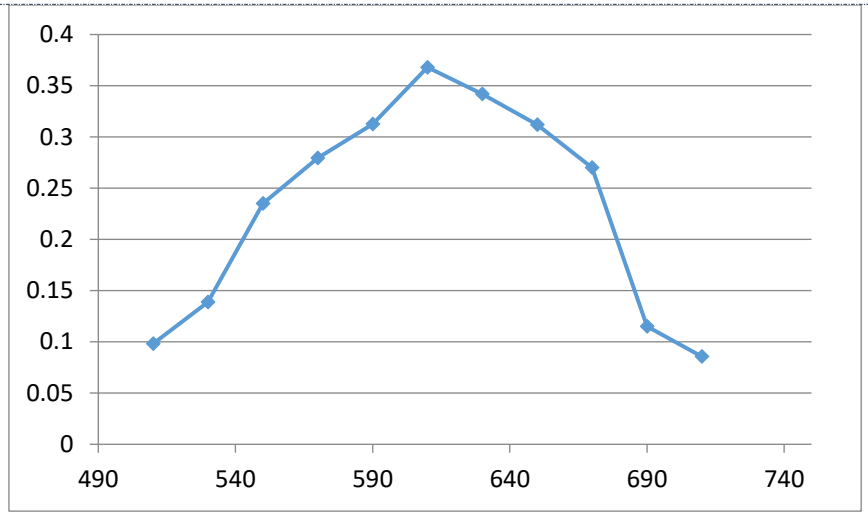

Fig-1.1: Absorption spectrum of Bifenox with MBTH /$FeCl_3$

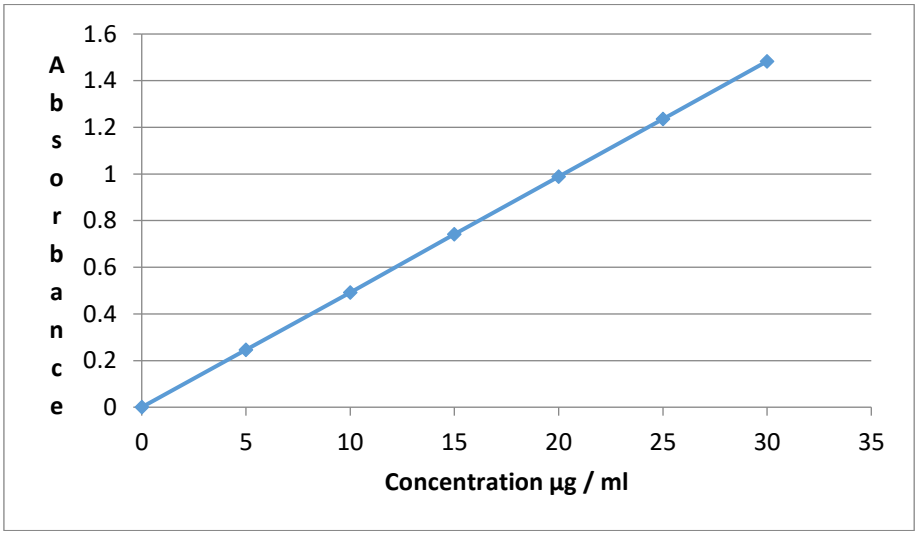

Fig-1.2: Beer's law plot of Bifenox with MBTH/$FeCl_3$

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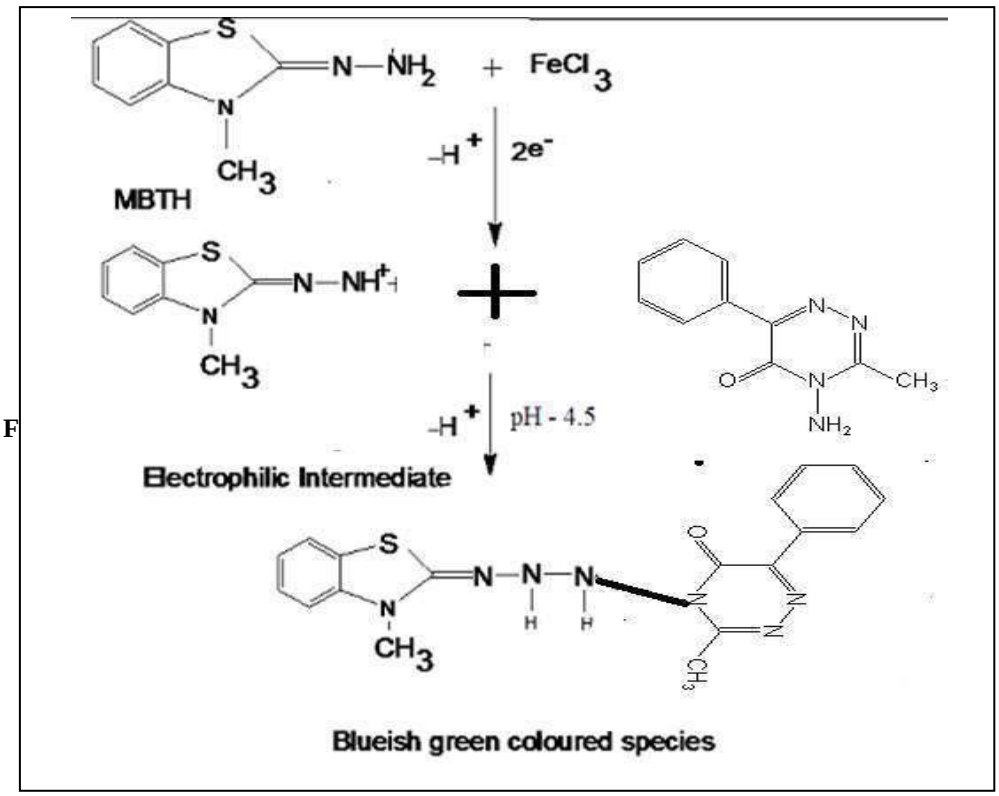

Table-1.1: Optical characteristics and precision by MBTH

Parameter	Visible method
Color	Bluish green
Absorption maxima (nm)	615
Beer's law limits (µg ml^{-1})	5-30
Molar absorptivity (l $mol^{-1}cm^{-1}$)	$0.9917*10^4$
Sandal's Sensitivity (µg cm^{-2})	0.0027
Regression equation (Y*)	----
Slope (b)	0.0421
Intercept(a)	0.000204
Standard deviation(SD)	0.9997
Correlation coefficient (r^2)	0.9999

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%RSD (Relative Standard deviation)*	1.7234
Range of errors	-----
Confidence limits with 0.05 level	1.6780
Confidence limits with 0.01 level	2.222
Limits of detection (LOD)(µg ml^{-1})	0.07204
Limits of quantification (LOQ) (µg ml^{-1})	0.02401

*RSD of six independent determinations

Table-1.2: Assay results of Bifenox in formulations by visible method

Name of the Formulation	**Formulation in (mg)**	**Amount found by the proposed method (mg)**	**Amount found by the reference method (mg)**	**% Recovery**
Sample -1	250	249.00	232.5	92.90
Sample -2	250	249.37	234.5	93.65

*t and F- values refer to comparison of the proposed method with reference method.
*Theoretical values at 95% confidence limits t= 0.00152 and F= 2.1985.

Table-1.3: Determination of accuracy of Bifenox

Amount of MET in formulation (mg)	**Amount of Standard MET added (mg)**	**Total amount found (mg)**	**% Recovery**
249.00 249.03 249.31	200 200 200	448.20 448.25 448.75	99.60 99.61 99.72
249.00 248.75 248.5	250 250 250	498.00 497.5 497.0	99.60 99.50 99.4
249.00 249.16 249.58	300 300 300	547.80 548.15 549.07	99.6 99.66 99.83

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Table-1.4: Statistical data for accuracy determination

Total amount found (mean)	Standard deviation	% RSD
249.11	0.1986	0.07958
248.75	0.24	0.1001
249.24	0.226	0.09136

The results are the mean of five readings at each level of recovery.

Table-1.5: Repeatability data for MET at 615 nm

Conc. (µg ml^{-1})	Abs 1	Abs 2	Abs 3	Mean	Std. deviation	(%)RSD*
0.2	0.0141	0.0142	0.0141	0.0142	0.0001	0.7042
0.8	0.0287	0.0286	0.0285	0.0286	0.0001	0.3496
1.2	0.0413	0.0431	0.04031	0.0431	0.0001	0.2320
1.6	0.0573	0.0572	0.0572	0.0572	0.0001	0.1748
2.0	0.0718	0.0717	0.0717	0.0717	0.0001	0.1394
2.4	0.0867	0.0866	0.0866	0.0866	0.0001	0.1154

*RSD of six independent determinations

Table-1.6: Color stability data for MBTH Method

Conc. in µg ml^{-1}	Time in hrs							
	4	8	12	16	20	24	28	32
20	0.984	0.986	0.984	0.984	0.984	0.984	0.914	0.984

Table-1.7: Recoveries of Bifenox from spiked vegetables (Potatoes and Tomatoes)

S. No	Amount of MET added µg ml^{-1}	Average amount found µg ml^{-1}		% Recover		SD		%RSD*	
		Potatoes	Tomatoes	Potatoes	Tomatoes	Potatoes	Tomatoes	Potatoes	Tomatoes
1	1.2	1.189	1.190	90.08	99.16	0.00057	0.00058	0.0479	0.0478
2	2.4	2.395	2.391	99.79	99.62	0.0023	0.0024	0.1002	0.1012
3	3.6	3.584	3.575	99.55	99.30	0.0051	0.0052	0.1452	0.1442
4	4.8	4.76	4.72	99.16	99.33	0.02309	0.02319	0.4886	0.4846
5	6.0	5.812	5.801	99.86	96.68	0.0063	0.0043	0.074	0.064
6	7.2	7.192	7.181	99.88	99.73	0.0063	0.0053	0.0737	0.0537

***Average of six determinations**

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Table-1.8: Recoveries of Bifenox from fortified water samples (tap and distilled water)

S. No	Fortification level (µg ml^{-1})	Tap water				Distilled water			
		amount found µg ml^{-1}	% Recover	SD	%RSD	amount found µg ml^{-1}	% Recover	SD	%RSD*
1	1.5	0.193	97.5	0.00287	0.1502	0.180	95.00	0.0025	0.1512
2	3	0.385	96.75	0.00285	0.7375	0.391	88.00	0.00281	0.7320
3	4.5	0.577	96.5	0.0062	0.1073	0.500	98.33	0.0052	0.1172
4	6	0.790	98.85	0.0022	0.0171	0.751	94.20	0.0210	0.052
5	7.5	0.990	99.00	0.0295	0.3072	0.954	95.60	0.2550	0.3065
6	9	1.190	99.23	0.0021	0.1752	1.192	99.25	0.0023	0.1672

***Average of six determinations= 99.960.0005**

RESULTS AND DISCUSSIONS

1. Optical parameters

In order to ascertain the optimum wavelength of maximum absorption (λ_{max}) formed in UV/Vis spectrophotometric method of the colored species formed in each specified amount of Bifenox in final solution 5 µg ml^{-1} was taken and the colors were developed following the above mentioned procedures individually. The absorption spectra were scanned on spectrophotometer in the wavelength region of 380-800 nm against corresponding reagent blanks. The regent blank absorption spectrum of each method was also recorded against distilled water /methanol. The results are graphically represented in fig- 1.1.

2. Parameters fixation

In developing these methods, a systematic study of the effects of various relevant parameters in the methods concerned were under taken by verifying one parameter at a time and controlling all other parameter to get the maximum color development reproducibility and reasonable period of stability of final colored species formed. The following studies were conducted in the present investigation.

Method :

The results obtained in this method were based on oxidation followed by coupling reaction of Bifenox with MBTH, Ferric chloride and Orthophosphoric acid to form green colored chromogen that exhibited maximum absorption at 615 nm against the corresponding reagent blank. The functional group used for the color development for this method was primary amine group. A schematic reaction mechanism of Bifenox with MBTH reagent was shown in (fig-1.3). The effect of various parameters such as concentration and volume of MBTH and strength of acid order of addition of reagents, solvent for final dilution were studied by means of control experiments varying one parameters at a time.

3. Optical Characteristics

The reference method adhere to Beer's law the absorbance at appropriate wave length of a set of solutions contains different amounts of Bifenox and specified amount of reagents (as described in the recommended procedure) were noted against appropriate reagent blank.

The Beer's law plot of the system illustrated graphically (fig:1.2) least square regression analysis was carried out for the slope. Intercept and Correlation Coefficient.Beer's law limits, Molar absorptivity & Sandells sensitivity for Bifenox with each of mentioned reagents were calculated. The optical characteristics were present in the table-1.1.

In order to test whether the colored species formed in the method adhere the Beer's law the absorbance at appropriate wavelength of a set of solutions contain different amounts of Bifenox and specified amount of reagents (as described in the recommended procedure) were noted against appropriate reagent blanks or distilled water. The Beers law plots of the system illustrated graphically (fig – 1.1) least square regression

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analysis was carried out for the slope, intercept and correlation coefficient, Beer's law limits molar absorptivity, Sandells sensitivity for Bifenox with each of mentioned reagents were calculated. The optical characteristics are presented in the table -1.1.

4. Precision

The precision of each one among the five proposed spectrophotometric methods were ascertained separately from the absorbance values obtain by actual determination of a fixed amount of Bifenox in 5 µg ml^{-1}in final solution. The percent relative standard deviation and percent range of error (at 0.05 and 0.01 confidence limits) were calculated for the proposed methods and presented in table-1.1.

5. Analysis of samples

Commercial formulations of Bifenox were successfully analyzed by the proposed methods. The values obtained from the proposed and reference methods were compared statistically by the t and F tests and were found that those proposed methods do not differ significantly from the reported methods and they were presented in tables-1.7&1.8,. The proposed methods also applied for samples spiked vegetables and water samples for good recoveries are obtained which were recorded in tables-1.7&1.8.

6. Accuracy

Recovery studies were carried by applying the standard addition method to sample present in formulations for the known amount of Bifenox the recovery studies were carried. By applying the same method to samples spiked vegetables and water samples to which known amount of Bifenox correspond to formulations.. At each level of recovery five determinations were performed and presented in tables -1.6&1.7. The results obtain were compared with expected results and were statistically validated in tables - 1.6,&1.7.

7. Linearity and range

The linearity of analytical method is its ability to elicit test results that are directly proportional to the concentration of analyze in sample within a given range. The range of analytical method is the interval between the upper and lower levels of analyze that have been demonstrated within a suitable level of precision, accuracy and linearity.

8. **Specificity and Selectivity**

Specificity is a procedure to detect quantitatively the analyze in the presence of components that may be expected to the present in the sample matrix. While selectivity is a procedure to detect the analyze qualitatively in presence of components that may be expected to present in the sample matrix. The excipient in formulations was spiked in a pre weighed quantity of drugs and then absorbance was measured and calculations were done to determine the quantity of the samples.

9. Repeatability

Standard solutions of Bifenox were prepared and absorbance was measured against the solvent as the blank. The observance of the same concentration solution was measure five times and standard deviation was calculated and presented in tables-1.5.

10. Interferences Studies

The effect of wide range of inactive, ingredients usually present in the formulations for the assay of Bifenox under optimum conditions was investigated. None of them interfered in the proposed methods even when they are present in excess fold than anticipated in samples.

11. Solution Stability

The stability of the solutions under study was established by keeping the solution at room temperature for 24 hrs. The results indicate no significant change in assay values indicating stability of drug in the solvent used during analysis. The results are recorded in tables -1.6.

CONCLUSION

The method was found to be accurate and precise, as indicated by recovery studies close to 100 and % RSD is not more than 2. The summery of validation parameters of proposed UV/Vis method is given.

The simple, accurate and precise UV/Vis method for the determination of Bifenox as bulk , commercial samples and spiked vegetables and water samples has been developed. The method may be recommended for routine and quality control analysis of the investigated pure in bulk and samples. The analytical solution is found to be stable up to 48 hrs at room temperature. Hence, it is concluded that the analytical method is validated and can be used for routine analysis and for stability study.

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REVERSE JORDAN*_ GENERALIZED DERIVATIONS ON SEMI PRIME RINGS

DR. DHANANJAYA REDDY

Abstract: This paper proved that if R is a semiprime *-ring of char. $\neq 6$ and $G: R \to R$ is an additive mapping satisfying the relation $G(xyx) = x^*y^*G(x) + x^*D(y)x + D(x)yx$ for all x,y in R, where D is some reverse Jordan *-derivation of R, then G is a Reverse Jordan *-generalized derivation.

Keywords: semiprime*-ring, reverse Jordan *-derivation, additive mapping, zero *-derivation

Introduction Bresar and Vukman [1],On some additive mappings in rings with involution, Aequationes Math. 38 (1989), 178-185.] first studied the *-derivations and Jordan *-derivations and proved that there are no non-zero *-derivations on non-commutative prime *-rings. The study of Jordan *-derivations has been motivated by the problem of the representability of quadratic forms by bilinear forms. Vukman and Kosi – Ulbl [2] proved that if R is a semiprime *-ring of char. $\neq 2$ such that R has a commutator which is not a zero divisor and G is an additive mapping that satisfies the identity, $G(xx^*) = G(x)x^* + xD(x^*)$ for all $x \in R$ for some derivation D of R, then G is a generalized derivation on R.

This paper proves that if R is a semiprime *-ring of char. $\neq 6$ and $G: R \to R$ is an additive mapping satisfying the relation $G(xyx) = x^*y^*G(x) + x^*D(y)x + D(x)yx$ for all x,y in R, where D is some reverse Jordan *-derivation of R, then G is a Reverse Jordan *-generalized derivation.

Preliminaries: An additive mapping $D: R \to R$, where R is a *-ring, is a *-derivation if $D(xy) = D(x)y^* + xD(y)$ hold for all $x,y \in R$ and is a Jordan *-derivation if $D(x^2) = D(x)x^* + xD(x)$ hold for x in R. An additive mapping $G: R \to R$ is a *-generalized derivation if there exists a *-derivation $D: R \to R$ such that $G(xy) = G(x)y^* + xD(y)$ for all x,y in R and an additive mapping $G: R \to R$ is Jordan *-generalized derivation if there exists a *-derivation $D: R \to R$ such that $G(x^2) = G(x)x^* + xD(x)$ for all $x \in R$. An additive mapping $D: R \to R$, where R is a *-ring, is a Reverse *-derivation if $D(xy) = y^*D(x) + D(y)x$ hold for all $x,y \in R$ and is a Reverse Jordan *-derivation if $D(x^2) = x^*D(x) + D(x)x$ hold for all x in R. An additive mapping $G: R \to R$ is a Reverse *-generalized derivation if there exists a reverse *-derivation $D: R \to R$ such that $G(xy) = y^*G(x) + D(y)x$ for all x,y in R and an additive mapping $G: R \to R$ is a Reverse Jordan *-generalized derivation if there exists a reverse *-derivation $D: R \to R$ such that $G(x^2) = x^* G(x) + D(x)x$ for all x in R.

Throughout this section consider R will be a semiprime *-ring.

Main Results: To prove the main results we require the following Lemma:

Lemma 1: Let R be a semiprime *-ring of char. $\neq 2$. Suppose that the relation $ax^*b^* + bxa = 0$ holds for all $x \in R$ and some $a,b \in R$. In this case $ab = ba = 0$ is fulfilled. In case R is prime, then either $a = 0$ or $b = 0$.

Proof: We have the relation

$ax^*b^* + bxa = 0$,for all $x \in R$. (1)

By putting in the above relation ybx for x and applying equation (1), we obtain

$0 = a(ybx)^* b^* + bybxa = (ax^*b^*)y^* b^* + bybxa.$

$= -bx (a y^* b^*) + bybxa.$

$= bxbya + bybxa.$

It proves that

$bxbya + bybxa = 0$,for all $x,y \in R$. (2)

In particular for $y=x$ the above relation reduces to $bxbxa = 0$, for all $x \in R$,

since R is char. $\neq 2$.

By applying equation (1), we obtain from the above relation

$bxax^*b^* = 0$, for all $x \in R$. (3)

Now by substituting in equation (2) xay for y and applying equation (1) and (3) we obtain

$0 = bx (bxa)ya + bxaybxa.$

$= -(bx ax^*b^*)ya + bxaybxa.$

$= bxaybxa.$

We have therefore proved that $(bxa)y (bxa) = 0$ holds for all $x,y \in R$. Hence it follows that

$bxa = 0$,for all $x \in R$. (4)

It gives relation $(ab) x (ab) = 0$, for all $x \in R$ which gives $ab = 0$.

Similarly, $ba = 0$. In case R is prime it follows from equation (4) that either $a = 0$ or $b = 0$. Hence the proof is complete.

Theorem 1: Let R be a semiprime *-ring of char. $\neq 2$ and let $D: R \to R$ be an additive mapping satisfying the relation $D(xyx) = D(x)y^*x^* + xD(y)\,x^* + xyD(x)$, for all $x,y \in R$. In this case D is a Jordan *-derivation.

Proof: Consider the relation

$D(xyx) = D(x)\,y^*x^* + xD(y)\,x^* + xyD(x)$, for all $x,y \in R$. (5)

By substituting xyx for y in the above relation gives

$D(x^2yx^2) = D(x)x^*y^*\,x^{*^2} + xD(xyx)x^* + x^2yxD(x)$.

Which implies

$D(x^2yx^2)=D(x)x^*y^*\,x^{*^2} +xD(x)y^*\,x^{*^2} +x^2D(y)\,x^{*^2} +x^2yD(x)x^*+x^2yxD(x)$, for all $x,y \in R$.(.6)

On the other hand, by substituting x^2 for x in equation (5) gives

$D(x^2yx^2) =D(x^2)y^*\,x^{*^2} +x^2D(y)\,x^{*^2} + x^2yD(x^2)$, for all $x,y \in R$. (7)

From (6) from (7),

$A(x)\,y^*\,x^{*^2} + x^2yA(x) = 0$,for all $x,y \in R$ (8)

where $A(x)$ stands for $D(x^2) - D(x)x^* - xD(x)$.From the relation above it follows from Lemma 1 that $A(x)\,x^2 = 0$, (9)

and$x^2A(x) = 0$,for all $x \in R$. (10)

By replacing x by $x+y$ in the equation (9)

$A(x)y^2 + A(y)\,x^2 + B(x,y)x^2 + B(x,y)y^2 + A(x)(xy + yx) + A(y)(xy + yx)+ B(x,y)(xy + yx) = 0$, for all $x,y \in R$, (11)

where $B(x,y)$ stands for $D(xy + yx) - D(x)y^* - xD(y) - yD(x)$. By putting $-x$ for x in the above relation and comparing the relation obtained with the relation (11),Which gives $B(x,y)x^2 + B(x,y)\,y^2 +A(x)\,(xy + yx) + A(y)\,(xy + yx) = 0$, for all $x,y \in R$, since R is of char. $\neq 2$.

By substituting $2x$ for x in the above relation gives

$4B(x,y)x^2 + B(x,y)y^2 + 4A(x)\,(xy + yx) + A(x)\,(xy + yx) = 0$,for all $x,y \in R$. (12)

Now (11) and (12) gives

$3A(x)\,(xy + yx) + 3B(x,y)x^2 = 0$,for all $x,y \in R$.

Since R is of char. $\neq 3$,

$A(x)\,(xy + yx) + B(x,y)x^2 = 0$, for all $x,y \in R$. (13)

By right multiplication of the above equation with $A(x)x$ and using (10) gives

$A(x)xy\,A(x)x + A(x)yx\,A(x)x = 0$,for all $x,y \in R$. (14)

By replacing y by yx, multiplying the equation (14) from the left side by x and using (10), we obtain $(xA(x)x)y\,(xA(x)x) = 0$, for all $x,y \in R$. Hence it follows that $xA(x)x = 0$, $x \in R$. Now the equation (14) reduces to $(A(x)x)y(A(x)x) = 0$, for all $x,y \in R$ which gives $A(x)x = 0$,for all $x \in R$. (15)

Now the equation (13) reduces to $A(x)yx + B(x,y)x^2 = 0$, for all $x,y \in R$. By right multiplication of this equation with $A(x)$ and left multiplication with x gives $(xA(x))\,y\,(xA(x)) = 0$, for all $x,y \in R$ which gives

$xA(x) = 0$, for all $x \in R$. (16)

From the equation (15), $A(x)y + B(x,y)x = 0$.

By right multiplication of the above equation with $A(x)$ gives $A(x)y\,A(x)=0$, for all $x,y \in R$, by the equation (16). Since R is semiprime, we have $A(x) = 0$, for all $x \in R$. In otherwords, $D(x^2) = D(x)x^* + xD(x)$, for all $x \in R$ which means that D is a Jordan *-derivation.

Theorem 2: Let R be a semiprime *-ring of char. $\neq 6$ and let $G: R \to R$ be an additive mapping satisfying the relation $G(xyx) = x^*y^*G(x) + x^*D(y)x + D(x)yx$, for all $x,y \in R$ and some reverse Jordan *-derivations D of R. Then G is a reverse Jordan *-generalized derivation.

Proof: Consider

$G(xyx) = x^*y^*G(x) + x^*D(y)x + D(x)yx$, for all $x,y \in R$. (17)

If replace y by xyx in equation (17), then

$G(x^2yx^2)= x^{*^2}\,y^*x^*G(x)+x^*D(xyx)x+ D(x)xyx^2$, for all $x,y \in R$. (18)

Equations (5) and (18), gives

$G(x^2yx^2) = x^{*^2}\,y^*\,x^*G(x) + x^{*^2}\,y^*D(x)x + x^{*^2}\,D(y)x^2 + x^*\,D(x)y\,x^2 + D(x)xyx^2$,for all $x,y \in R$. (19)

From replacing x by x^2 in (17),

$G(x^2yx^2) = x^{*^2}\,y^*G(x^2) + x^{*^2}\,D(y)x^2 + D(x^2)yx^2$, for all $x,y \in R$. (20)

Since D is a Reverse Jordan *-derivation, equation (20) may be rewritten as

$G(x^2yx^2) = x^{*^2}\,y^*G(x^2) + x^{*^2}\,D(y)x^2 + x^*D(x)yx^2 + D(x)xyx^2$, for all $x,y \in R$. (21)

By (19) and (21),

$x^{*^2}\, y^*A(x) = 0$, for all $x,y \in R$ (22)

where $A(x) = G(x^2) - x^*G(x) - D(x)x$.

It proves that

$A(x) = 0$, for all $x \in R$. (23)

If replace y by y^* in equation (22), then

$x^{*^2}\, yA(x) = 0$, for all $x,y \in R$. (24)

On left multiplication by $A(x)$ and right multiplication by x^{*^2} in equation (24), then $A(x)\, x^{*^2}\, yA(x)\, x^{*^2} = 0$, for all $x,y \in R$. Since R is semiprime,

$A(x)\, x^{*^2} = 0$, for all $x \in R$. (25)

Now by replacing y by $A(x)y\, x^{*^2}$ in equation (24) and by the semiprimeness of R, then

$x^{*^2}\, A(x) = 0$, for all $x \in R$. (26)

By linearizing equation (26), then

$y^{*^2}\, A(x) + x^{*^2}\, A(y) + x^{*^2}\, B(x,y) + y^{*^2}\, B(x,y) + (xy + yx)^* A(x) + (xy + yx)^* A(y) + (xy + yx)^* B(x,y) = 0$, for all $x,y \in R$, (27)

where $B(x,y)$ stands for $G(xy + yx) - y^*D(x) - x^*D(y) - D(y)x - D(x)y$.

By putting $-x$ for x in the above relation and comparing the relation obtained with the relation (27) which gives

$x^{*^2}\, B(x,y) + y^{*^2}\, B(x,y) + (xy + yx)^* A(x) + (xy + yx)^* A(y) = 0$, for all $x,y \in R$. (28)

By substituting $2x$ for x in equation (28) gives

$\dot{x}^{*^2}\, 4B(x,y) + y^{*^2}\, B(x,y) + 4(xy + yx)^* A(x) + (xy + yx)^* A(y) = 0$, for all $x,y \in R$. (29)

By subtracting the relation (28) from (29),

$3\, x^{*^2}\, B(x,y) + 3(xy + yx)^* A(x) = 0$, for all $x,y \in R$.

Since R is of char. $\neq 3$,

$x^{*^2}\, B(x,y) + (xy + yx)^* A(x) = 0$,

for all $x,y \in R$. (30)

By right multiplication of the above relation by $x^*A(x)$ and using (25),

$x^*A(x)\, x^*\, y^*A(x) + x^*A(x)\, y^*x^*A(x) = 0$, for all $x,y \in R$. (31)

By substitute yx for y in equation (31), multiplying the equation (31) from the right hand side by x^* and using (25) gives

$x^*\, A(x)\, x^*\, y^*\, x^*A(x)x^* = 0$, $x,y \in R$.

By replacing y by y^* and by the semiprimeness of R,

$x^*A(x)x^* = 0$, $x \in R$. Now the relation (31) reduces to $(x^*A(x))\, y^*(x^*A(x)) = 0$, $x,y \in R$, which gives

$x^*A(x) = 0$, for all $x \in R$. (32)

Now the relation (30) reduces to $x^{*^2}\, B(x,y) + x^*\, y^*A(x) = 0$, $x,y \in R$.

By left multiplication of this relation by $A(x)$, right multiplication by x^* and replacing y by y^* gives

$(A(x)x^*)\, y\, (A(x)x^*) = 0$, for all $x,y \in R$, which gives $A(x)x^* = 0$, for all $x \in R$. (33)

By linearizing relation (32) gives

$y^*A(x) + x^*\, A(y) + x^*B(x,y) + y^*\, B(x,y) = 0$. for all $x,y \in R$. (34)

By putting $-x$ for x in the above relation and comparing the relation obtained with the relation (34) gives

$y^*A(x) + x^*B(x,y) = 0$, for all $x,y \in R$. (35)

By left multiplication of the above relation by $A(x)$ and using (33) gives that

$A(x)\, y^*A(x) = 0$, $x,y \in R$, which implies that $A(x) = 0$, for all $x \in R$. In otherwords,

$G(x^2) = x^*G(x) + D(x)x$, for all $x \in R$ which means that G is a reverse Jordan*-generalized derivation.

It is clear that if we use the reverse *-derivation D to be zero *-derivation, in the above theorem, we get

Corollary 1: Let R be a semiprime *-ring of char. $\neq 6$ and let T: $R \to R$ be an additive mapping. If $T(xyx) = x^*y^*T(x)$ for all $x,y \in R$, then T is a right Jordan *-centralizer.

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GROWTH OF COMMERCIAL CROPS IN INDIA : AN OVERVIEW

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Abstract

Commercial crops with greater economic importance and play a vital role in Agriculture sector and Indian economy. More than 70 per cent of people are depends of agriculture sector. Some people are engaged in commercial crops activities work. It is the source of livelihood for millions of small and marginal farmers and provides employment for millions of plantation workers. Some people self employed in this crops rural and semi-urban livelihood. In the economic development of India level of commercial crops is highly increased in GDP growth rate. Being the export oriented crops, changes in trade policies affect the production of these crops much more than any other crops. Trade liberalization policies adopted in India with the introduction of new economic policies has greater impact on the area, production and productivity of these crops. The aim of this paper is to study the changing pattern in area production and productivity of commercial crops in India during the study period. Indian farming systems are a strategically utlised, to according to the locations where they are most suitable. The farming system essentially contributes to the domestic GDP of India subsistence farming, organic farming and industrial farming. Different types of farming they use, some are based on horticulture, lay farming, agro forestry and also many more. Geographical location of India's, certain parts of experience different climates, agricultural productivity very differently. India is a very dependent on its monsoon based periodic rainfall. Rainfall is a change in the season variations and also significant and the consequence of these are bumper harvests and crop searing. One of the main priorities in Indian farming is irrigation. Indian agriculture sectors production is second position in the world.

Keywords: *Oil Seeds, Groundnut, Rapeseed and Mustard Soya bean, Tea, Coffee, Cotton (lint), Raw Jute and Mesta, Tobacco, Area, Production and Yield.*

Introduction

India is top producer country of many crops. The major crops in India can be divided into four categories viz. Food grains (Rice, Wheat, Maize, Millets and Pulses), Cash Crops (Cotton, Jute, Sugarcane, Tobacco, and Oilseeds), Plantation Crops (Tea, Coffee, Coconut and,

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3D MHD slip flow of a nanofluid over a slendering stretching sheet with thermophoresis and Brownian motion effects

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ABSTRACT

A theoretical analysis is performed to investigate the free convective heat and mass transfer in three-dimensional magnetohydrodynamic slip flow of a nanofluid over a slendering (variable thickness) stretching sheet in the presence of thermophoresis and Brownian motion effects. Our considerations are water as base fluid, graphene and magnetite as nanoparticles and we did the simultaneous study of them on various profiles. R-K-Felhberg-integration scheme is employed to resolve the altered governing nonlinear equations. Influences of the parameters of concern on the common profiles (velocity, temperature, concentration) are conversed (in two cases). By viewing the same parameters, the skin friction coefficient, heat and mass transfer are discussed with the assistance of tables in two instances. It is found that the momentum, thermal and concentration boundary layers of water-graphene and water-magnetite nanofluids are non-uniform. It is also found that the rate of heat and mass transfer is high in water-graphene nanofluid when compared with the water-magnetite nanofluid.

1. Introduction

In recent years, graphene (the two-dimensional lattice of carbon) inspire the research in modern science as it is one of the promising materials for execution in the future genesis electronic devices. Since the cost and convenience of synthesize is better among the other nanomaterials and having the highest thermal conductivity within the total carbon family, graphene and its nanocomposites are more important in the applications like lithium ion batteries, super capacitors, gas censors, water desalination, fuel cells etc. Credit goes to Novoselov et al. [1,2], who discover it, unfolded a new era in research for condensed-matter physics and material science. Yu et al. [3] derived a method to prepare a stable nanofluid, where the base fluid is ethylene glycol and nanoparticle is graphene oxide and noticed that GON helps to rise the thermal conductivity of nanofluids. Later Baby and Ramaprabhu [4,5] examined the nanofluids comprising graphene for thermal conductivity and heat transfer. They discovered that magnifying the volume fraction enhances the electrical conductivity and nanofluids comprise of *Cuo/HEG* can be utilized for coolant applications. With the aid of squeezes developed by powder contraction and paper preparation procedure, Marinho et al. [6] examined the electrical conductivity of graphene. After that, some authors used various methods such as CVD and Hummers to synthesize the graphene [7–9]. Furthermore, Mehrali et al. [10] prepared nitrogen-doped graphene nanofluids with the assistance of two-step method and investigated the electrical conductivity of them. They noticed that their electrical conductivities rises linearly with the gain in the concentration of them.

Generally, researchers used to assume no-slip condition. But in some special cases like micro-electro mechanical systems, in order to explain the fluid flow, slip conditions are necessary. When the fluids composed of distinct particles like suspensions, foams, polymer solutions and emulsions, partial slip may take place across a moving surface. Slip flow has tremendous applications like the smoothening of internal cavities and artificial heart shells. Note that even in this slip flow regime, the fluid motion follow the Navier-Stokes equations. Initially Brock [11] made a thermal force theory in the slip flow regime. Subsequently, a few investigators [12–15] studied the slip parameters through different channels. After that, several researchers [16–20] continue the investigation of slip flow across stretching/shrinking surfaces. Some of their observations are (a) slip flow model parameters powerfully influenced the surface shear stress and the flow velocity (b) slip parameters (velocity slip, temperature jump) keep down the velocity and temperature respectively (c) slip and velocity ratio parameters lessen the heat transfer rate. Furthermore, this work was widened by various investigators [21–29] by considering nanofluids.

In this study, we are extending the work of Anjali Devi and Prakash [30] by considering nanofluid flow (water-magnetite and water-graphene) with thermophoresis and Brownian motion effects. R-K-Felhberg-Integration scheme is employed to yield the numerical solutions. Influences of the parameters of interest on the common profiles

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Nomenclature

a	Constant
b	Thermal accommodation coefficient
$B(x)$	Magnetic field parameter
B_0	Magnetic field strength (T)
c	Physical parameter related to stretching sheet
C	Concentration of the fluid ($kg\,m^{-2}$)
C_f	Skin friction coefficient
C_p	Specific heat at constant pressure ($J\,kg\,K^{-1}$)
C_∞	Concentration of the fluid in the free stream ($kg\,m^{-2}$)
d	Concentration accommodation coefficient
D_B	Brownian coefficient
D_T	Thermophoresis coefficient
f	Dimensionless velocity
f_1	Maxwell's reflection coefficient
g	Dimensionless transverse velocity
J	Coefficient related to stretching sheet
j_1^*	Dimensional velocity slip parameter
j_2^*	Dimensional temperature jump parameter
j_3^*	Dimensional concentration jump parameter
j_1	Dimensionless velocity slip parameters
j_2	Dimensionless temperature jump parameter
j_3	Dimensionless concentration jump parameter
k	Thermal conductivity ($W\,m^{-1}\,K^{-1}$)
Le	Lewis number
M	Magnetic field parameter
n	Velocity power index parameter
Nb	Brownian motion parameter
Nt	Thermophoresis parameter
Nu_x	Local Nusselt number
Pr	Prandtl number
Re_x	Local Reynolds number
Sh_x	Local Sherwood number
T	Temperature of the fluid (K)
T_∞	Temperature of the fluid in the free stream (K)
u,v,w	Velocity components in x,y and $z$directions ($m\,s^{-1}$)
$u_w(x)$	Stretching velocity of the sheet ($m\,s^{-1}$)
$v_w(x)$	Transpiration velocity ($m\,s^{-1}$)

Greek Symbols

τ	Thermophoretic parameter
ϕ	Solid volume fraction of the nanoparticles
ς	Similarity variable
σ	Electrical conductivity ($m\,\Omega\,m^{-1}$)
γ	Ratio of specific heats
θ	Dimensionless temperature
Φ	Dimensionless concentration
ρ	Density ($kg\,m^{-3}$)
Λ	Wall thickness parameter
μ	Dynamic viscosity ($Pa\,S$)
υ	Kinematic viscosity ($m^2\,s^{-1}$)
ξ_1,ξ_2,ξ_3	Mean free path (constant)

Subscripts

f	Base fluid
nf	Nanofluid
s	Nanoparticle

(velocity, temperature and concentration) are conversed (in two cases). By viewing the same parameters, skin friction coefficient, heat and mass transfer are discussed with the assistance of tables in two instances.

2. Mathematical Formulation

We consider a steady, three dimensional, incompressible electrically conducting MHD slip flow of nanofluid across a slendering stretching sheet by assuming$z=J(x+y+c)^{(1-n)0.5}$,$n\neq1$ (See Fig.1). To disregard the stimulated magnetic field, we consider the magnetic Reynolds number is very low. Here, our considerations for the nanofluid are water (base fluid), graphene and magnetite (nanoparticles). The thermophysical properties of the nanofluids are chosen as depicted in Table 1. Thermophoresis and Brownian motion effects are considered in this study.

With the above assumptions, the governing equations can be expressed as:

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=0, \tag{1}$$

$$\rho_{nf}\left(u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}+w\frac{\partial u}{\partial z}\right)=\mu_{nf}\frac{\partial^2 u}{\partial z^2}-\sigma_{nf}B^2(x)u, \tag{2}$$

$$\rho_{nf}\left(u\frac{\partial v}{\partial x}+v\frac{\partial v}{\partial y}+w\frac{\partial v}{\partial z}\right)=\mu_{nf}\frac{\partial^2 v}{\partial z^2}-\sigma_{nf}B^2(x)v, \tag{3}$$

$$(\rho c_p)_{nf}\left(u\frac{\partial T}{\partial x}+v\frac{\partial T}{\partial y}+w\frac{\partial T}{\partial z}\right)=k_{nf}\frac{\partial^2 T}{\partial z^2}+\tau\left(D_B\frac{\partial C}{\partial z}\frac{\partial T}{\partial z}+\frac{D_B}{T_\infty}\left(\frac{\partial T}{\partial z}\right)^2\right), \tag{4}$$

$$u\frac{\partial C}{\partial x}+v\frac{\partial C}{\partial y}+w\frac{\partial C}{\partial z}=D_B\frac{\partial^2 C}{\partial z^2}+\frac{D_T}{T_\infty}\frac{\partial^2 T}{\partial z^2}, \tag{5}$$

the representing boundary conditions are

$$\left.\begin{aligned}&u(x,y)=u_w(x)+j_1^*\left(\frac{\partial u}{\partial z}\right),\ v(x,y)=v_w(x)+j_1^*\left(\frac{\partial v}{\partial z}\right),\\&T(x,y)=T_w(x)+j_2^*\left(\frac{\partial T}{\partial z}\right),\ C(x,y)=C_w(x)+j_3^*\left(\frac{\partial C}{\partial z}\right)\\&and\\&u=0,v=0,T=T_\infty,C=C_\infty\ at\ z=\infty,\end{aligned}\right\} \tag{6}$$

where

$$j_1^*=\left[\frac{2-f_1}{f_1}\right]\xi_1(x+y+c)^{(1-n)0.5},\ \xi_2=\left(\frac{2\gamma}{\gamma+1}\right)\frac{\xi_1}{\mathrm{Pr}}, \tag{7}$$

$$j_2^*=\left[\frac{2-b}{b}\right]\xi_2(x+y+c)^{(1-n)0.5},\ \xi_3=\left(\frac{2\gamma}{\gamma+1}\right)\frac{\xi_2}{\mathrm{Pr}}, \tag{8}$$

$$j_3^*=\left[\frac{2-d}{d}\right]\xi_3(x+y+c)^{(1-n)0.5},\ B(x)=B_0(x+y+c)^{\frac{n-1}{2}}, \tag{9}$$

$$\left.\begin{aligned}&u_w(x)=a(x+y+c)^{(n-1)0.5},\ v_w(x)=a(x+y+c)^n,\ \tau=\frac{(\rho C_p)_s}{(\rho C_p)_f}\\&T_w(x)=T_\infty+T_0(x+y+c)^{(1-n)0.5},\ C_w(x)=C_\infty+C_0(x+y+c)^{(1-n)0.5}\end{aligned}\right\}\text{for } n\neq1 \tag{10}$$

Table 1
Thermophysical properties of the water and the nanoparticles.

Physical properties	Pure water	Graphene	Magnetite
$\rho(Kg/m^3)$	997	2250	5180
$C_p(J/Kg\,K)$	4076	2100	670
$k(W/m\,K)$	0.605	2500	9.7
$\sigma(S/m)$	0.005	$1x10^7$	$1x10^5$

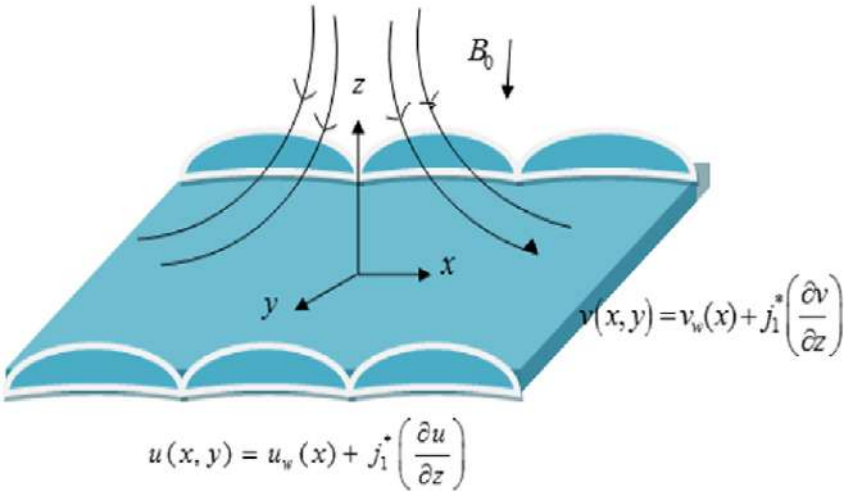

Fig. 1. Physical model (Variable thickness stretching sheet).

In this work, we used the following definitions:

$$\left.\begin{aligned}&\frac{\mu_{nf}}{\mu_f}=\frac{1}{(1-2.5\phi)},\frac{\rho_{nf}}{\rho_f}=1-\phi+\phi r,\frac{(\rho c_p)_{nf}}{(\rho c_p)_f}=(1-\phi)+\phi e\\&\frac{k_{nf}}{k_f}=1+\frac{3(k-1)\phi}{k+2},\frac{\sigma_{nf}}{\sigma_f}=\frac{3(\sigma-1)\phi}{(\sigma+2)-(\sigma-1)\phi}+1\\&\text{where } r=\frac{\rho_s}{\rho_f},e=\frac{(\rho c_p)_s}{(\rho c_p)_f},k=\frac{k_s}{k_f},\sigma=\frac{\sigma_s}{\sigma_f},\end{aligned}\right\}\tag{11}$$

The governing non-linear partial differential equations are translated as non-linear ordinary differential equations with the utilization of the below similarity transmutations.

$$\zeta=z\left(\frac{(n+1)a}{2\upsilon}\right)^{0.5}(x+y+c)^{(n-1)0.5}\tag{12}$$

$$T=T_\infty+(T_w(x)-T_\infty)\theta,C=C_\infty+(C_w(x)-C_\infty)\phi\tag{13}$$

$$\left.\begin{aligned}&u=a\,(x+y+c)^n\frac{\partial f}{\partial\zeta},v=a\,(x+y+c)^n\frac{\partial g}{\partial\zeta}\\&w=-\left(\frac{2a\nu}{n+1}\right)^{0.5}(x+y+c)^{(n-1)*0.5}\left[\frac{n+1}{2}(f+g)+\zeta\left(\frac{n-1}{2}\right)\left(\frac{\partial f}{\partial\zeta}+\frac{\partial g}{\partial\zeta}\right)\right]\end{aligned}\right\}\tag{14}$$

By applying (11), (12), (13) and (14), the Eqs. (2)-(5) altered as the following:

$$\left.\begin{aligned}&\frac{1}{(1-2.5\phi)}\frac{n+1}{2}\frac{\partial^3 f}{\partial\zeta^3}-[(1-\phi)+\phi r]\left(n\left(\frac{\partial f}{\partial\zeta}\right)^2+n\frac{\partial f}{\partial\zeta}\frac{\partial g}{\partial\zeta}-\frac{n+1}{2}(f+g)\frac{\partial^2 f}{\partial\zeta^2}\right)\\&-\left(\frac{3(\sigma-1)\phi}{(\sigma+2)-(\sigma-1)\phi}+1\right)M\frac{\partial f}{\partial\zeta}=0,\end{aligned}\right\}\tag{15}$$

$$\left.\begin{aligned}&\frac{1}{(1-2.5\phi)}\frac{n+1}{2}\frac{\partial^3 g}{\partial\zeta^3}-[(1-\phi)+\phi r]\left(n\left(\frac{\partial g}{\partial\zeta}\right)^2+n\frac{\partial f}{\partial\zeta}\frac{\partial g}{\partial\zeta}-\frac{n+1}{2}(f+g)\frac{\partial^2 g}{\partial\zeta^2}\right)\\&-\left(\frac{3(\sigma-1)\phi}{(\sigma+2)-(\sigma-1)\phi}+1\right)M\frac{\partial g}{\partial\zeta}=0,\end{aligned}\right\}\tag{16}$$

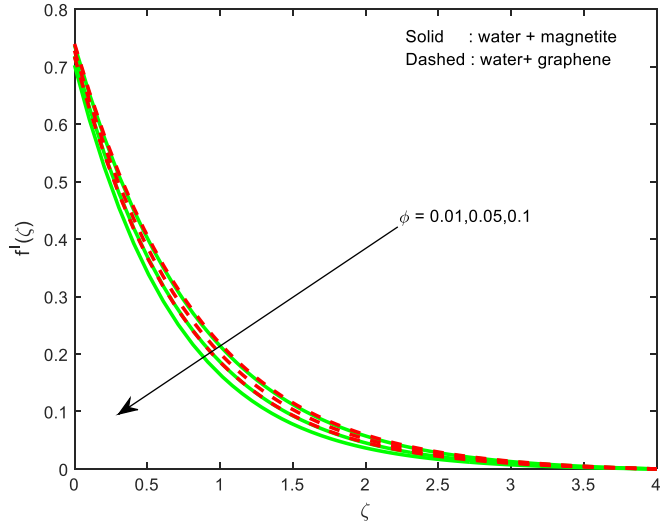

Fig. 2. Velocity profile for various values of nanoparticle volume fraction ϕ.

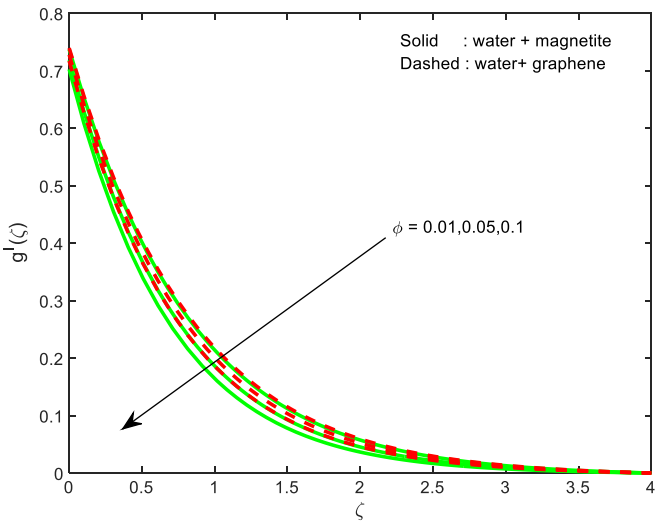

Fig. 3. Velocity profile for various values of nanoparticle volume fraction ϕ.

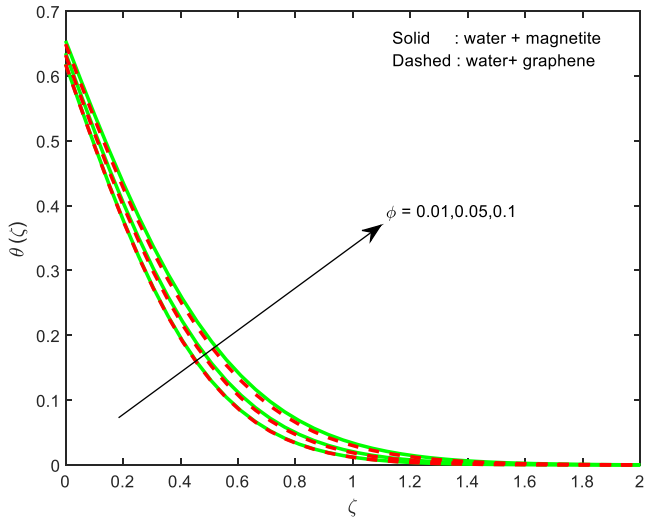

Fig. 4. Temperature profile for various values of nanoparticle volume fraction ϕ.

$$\left.\begin{aligned}\frac{k_{nf}}{k_f}\frac{\partial^2\theta}{\partial\zeta^2}-\frac{2}{n+1}\Pr[(1-\phi)+\phi d]\left(\frac{1-n}{2}\left(\frac{\partial f}{\partial\zeta}+\frac{\partial g}{\partial\zeta}\right)\theta-\frac{n+1}{2}(f+g)\frac{\partial\theta}{\partial\zeta}\right)\\ +Nb\frac{\partial\theta}{\partial\zeta}\frac{\partial\phi}{\partial\zeta}+Nt\left(\frac{\partial\theta}{\partial\zeta}\right)^2=0,\end{aligned}\right\} \tag{17}$$

$$\frac{\partial^2\phi}{\partial\zeta^2}+\frac{Nt}{Nb}\frac{\partial^2\theta}{\partial\zeta^2}-Le\left(\left(\frac{\partial f}{\partial\zeta}+\frac{\partial g}{\partial\zeta}\right)\frac{1-n}{1+n}\phi-(f+g)\frac{\partial\phi}{\partial\zeta}\right)=0, \tag{18}$$

and the representing boundary conditions are

$$\left.\begin{aligned}f(0)=\Lambda\left(\frac{1-n}{n+1}\right)\left[1+j_1\frac{\partial^2 f}{\partial\zeta^2}\Big|_{\zeta=0}\right],f'(0)=\left[1+j_1\frac{\partial^2 f}{\partial\zeta^2}\Big|_{\zeta=0}\right],\\ g(0)=\Lambda\left(\frac{1-n}{n+1}\right)\left[1+j_1\frac{\partial^2 g}{\partial\zeta^2}\Big|_{\zeta=0}\right],g'(0)=\left[1+j_1\frac{\partial^2 g}{\partial\zeta^2}\Big|_{\zeta=0}\right],\\ \theta(0)=\left[1+j_2\frac{\partial\theta}{\partial\zeta}\Big|_{\zeta=0}\right],\phi(0)=\left[1+j_3\frac{\partial\phi}{\partial\zeta}\Big|_{\zeta=0}\right],\\ \frac{\partial f}{\partial\zeta}=0,\frac{\partial g}{\partial\zeta}=0,\theta=0,\phi=0\text{ as }\zeta\to\infty\end{aligned}\right\} \tag{19}$$

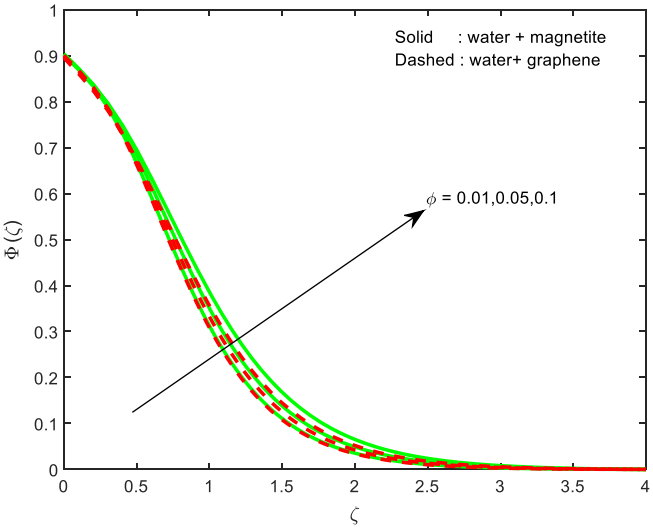

Fig. 5. Concentration profile for various values of nanoparticle volume fraction ϕ.

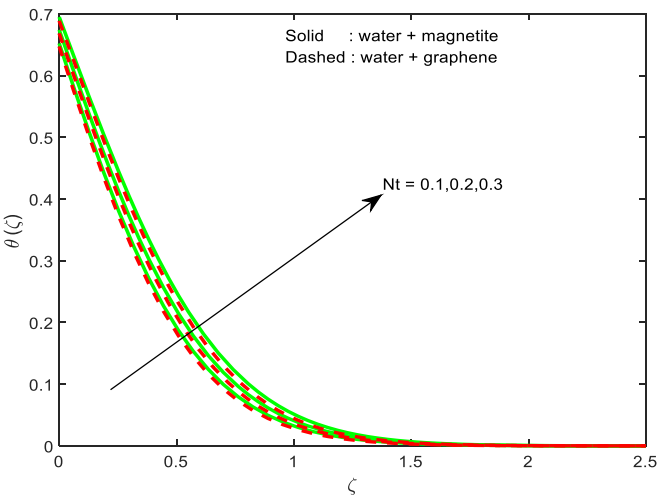

Fig. 6. Temperature profile for various values of thermophoresis parameter *Nt*.

where M, Pr, Nb, Nt, Le are specified as

$$M=\frac{\sigma_f B_0^2}{\rho_f a},\ \Pr=\frac{\mu_f(c_p)_f}{k_f},Nb=\frac{\tau D_B C_0}{k_f},Nt=\frac{\tau D_T T_0}{T_\infty k_f},Le=\frac{\upsilon_f}{D_B}, \tag{20}$$

For the sake of engineering, skin-friction coefficient, heat and mass transfer rates (following non-dimensionalization) are established as

$$\left.\begin{aligned}C_f=2\left(\frac{n+1}{2}\right)^{0.5}\left(1/\sqrt{\mathrm{Re}}\right)\frac{\partial^2 f}{\partial\zeta^2}\Big|_{\zeta=0},Nu_x=-\left(\frac{n+1}{2}\right)^{0.5}\frac{\partial\theta}{\partial\zeta}\Big|_{\zeta=0}\\ \mathrm{Sh}_x=-\left(\frac{n+1}{2}\right)^{0.5}\left(\sqrt{\mathrm{Re}}\right)\frac{\partial\phi}{\partial\zeta}\Big|_{\zeta=0}\end{aligned}\right\} \tag{21}$$

where $\mathrm{Re}=\frac{u_w(x)(x+y+c)}{\upsilon_f}$,

3. Results and Discussion

Numerical solutions are obtained by solving the Eqs. (15)-(18) with the boundary conditions Eq. (19) by employing R-K-Felhberg-integration scheme. For numerical discussion, we allotted the values to the non-dimensional parameters as $\Pr=6.587, n=0.65, Le=1, M=2, j_1=$

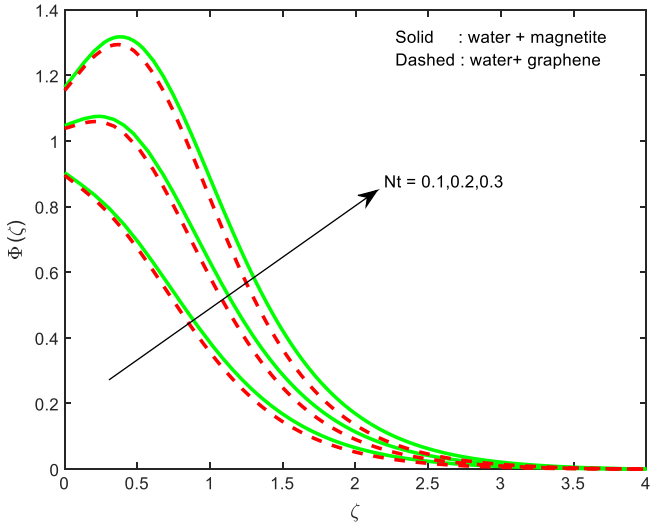

Fig. 7. Concentration profile for various values of thermophoresis parameter *Nt*.

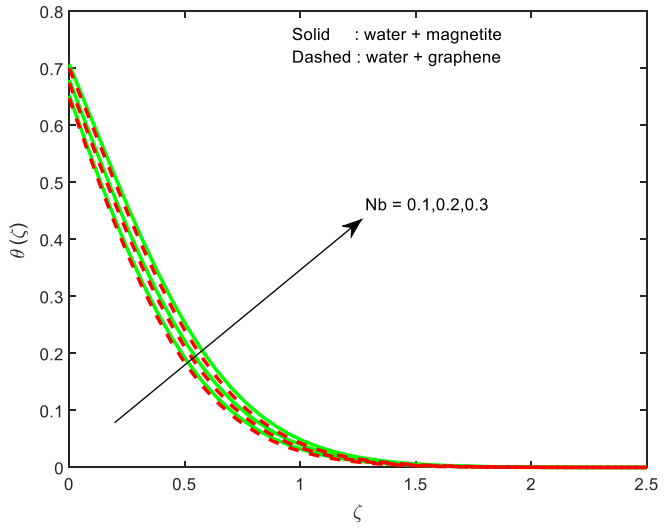

Fig. 8. Temperature profile for various values of Brownian motion parameter *Nb*.

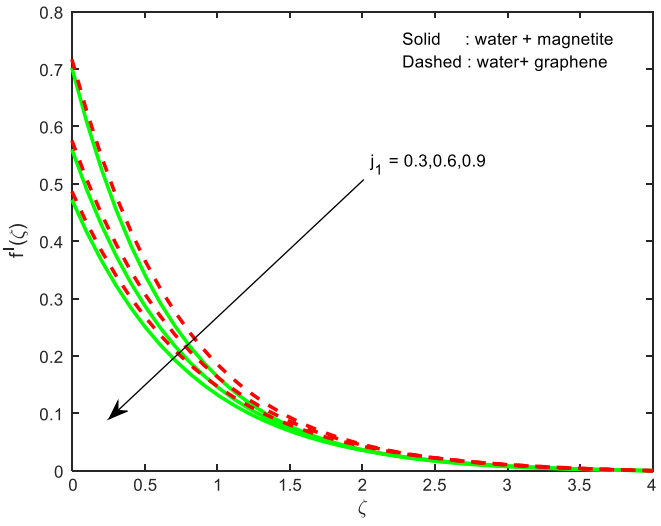

Fig. 10. Velocity profile for various values of velocity slip parameter j_1.

$j_2 = j_3 = 0.3, \Lambda = 0.1, \phi = 0.1, Nb = 0.1, Nt = 0.1$. These are fixed unless otherwise they showed in the plots. With the assistance of plots, we examined the effect of versatile parameters like slip, magnetic field, Brownian motion, thermophoresis etc., on three profiles (velocity, temperature and concentration). At the end, we discussed about the same effects on skin friction, heat and mass transfer by using tables. In the plots, solid line indicates magnetite mixture and dashed line indicate grapheme mixture.

Figs. 2-5 shows that raising the values of nanofluid volume fraction parameter lessen the velocity field and helps in improve the temperature and concentration fields. We know that the thermal boundary layer thickness rises with the rise in the volume fraction of nanoparticles due to increasing thermal conductivity caused by the suspended nanoparticles. Magnetite mixture exhibit the improvement in temperature field compared to graphene mixture on velocity profiles but reverse effect observed in velocity field.

Enhancing the thermophoresis parameter *Nt* improves the thickness of both thermal and concentration boundary layers. We can watch this behavior in Figs. 6 and 7. Brownian motion parameter *Nb*enhances the temperature (Fig. 8) and lessen the concentration (Fig. 9). Note that the Brownian motion of the nanoparticles induces convection which in turn improves the thermal conductivity of nanofluids. So, higher the Brownian motion causes to increase the temperature profiles.

It is evident from Figs. 10-13 that the all profiles (velocity, temperature and concentration) decrease with the gain in the corresponding slip parameter values(j_1, j_2, j_3). Since the flow of fluids descends from stretching of the sheet, rise in velocity slip of fluid through a stretching sheet lessen the velocity of the fluid. It is also observed that water-graphene nanofluid is highly influenced by the variation in concentration and temperature jump parameters. Fig. 14 says that rising values of Lewis number *Le* lessen the concentration field.

The effects of the aforesaid parameters on skin friction coefficient, local Nusselt number and local Sherwood number in two cases (magnetite and graphene) are portrayed numerically in Tables 2 & 3. From Table 2 (magnetite and water mixture), it is noticeable that nanofluid volume fraction, thermophoresis, Brownian motion, velocity slip and temperature jump parameters lessen the heat transfer rate. And also velocity slip parameter rises the skin friction coefficient and Lewis number speedily improves the mass transfer rate. We can notice the similar behavior in Table 3 with different values. It is evident to conclude that the heat and mass transfer rate is high in water-graphene nanofluid when compared with water-magnetite nanofluid.

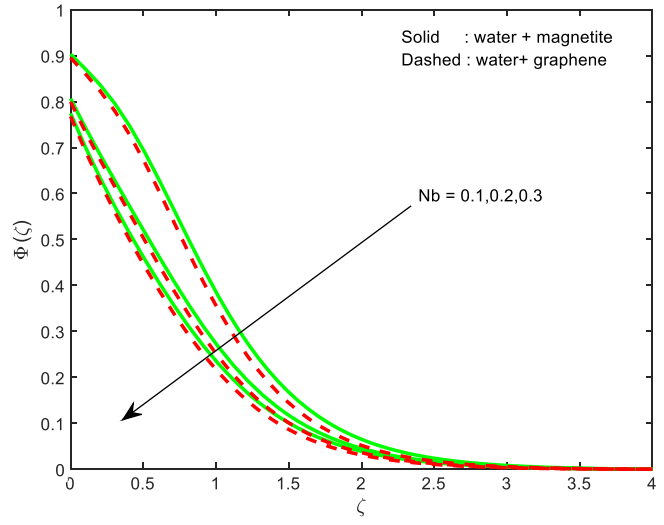

Fig. 9. Concentration profile for various values of Brownian motion parameter *Nb*.

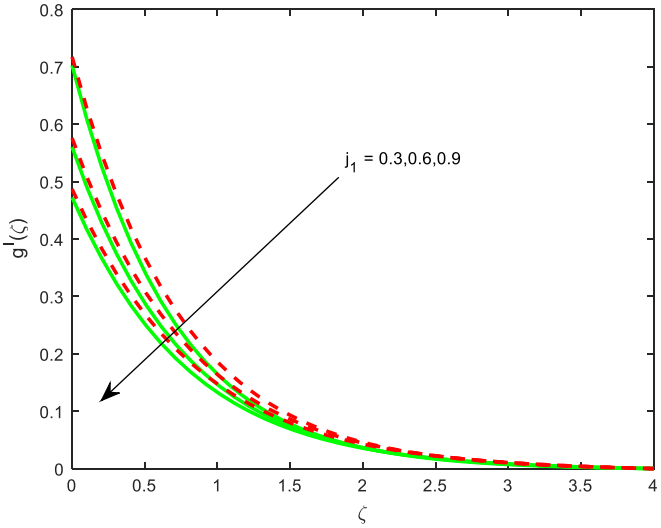

Fig. 11. Velocity profile for various values of velocity slip parameter j_1.

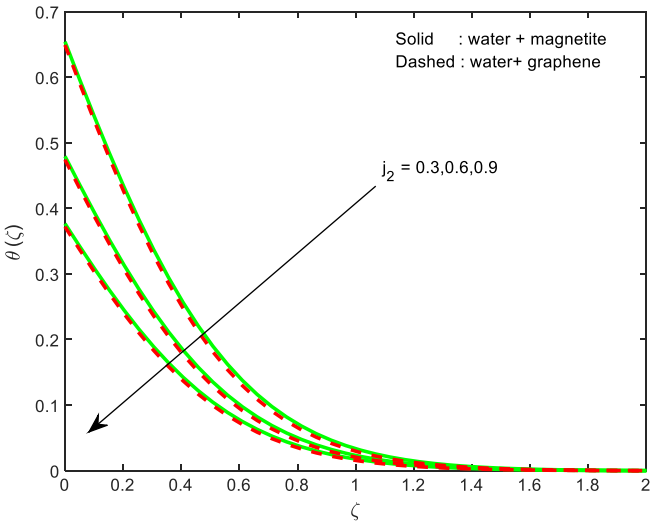

Fig. 12. Temperature profile for various values of temperature jump parameter j_2.

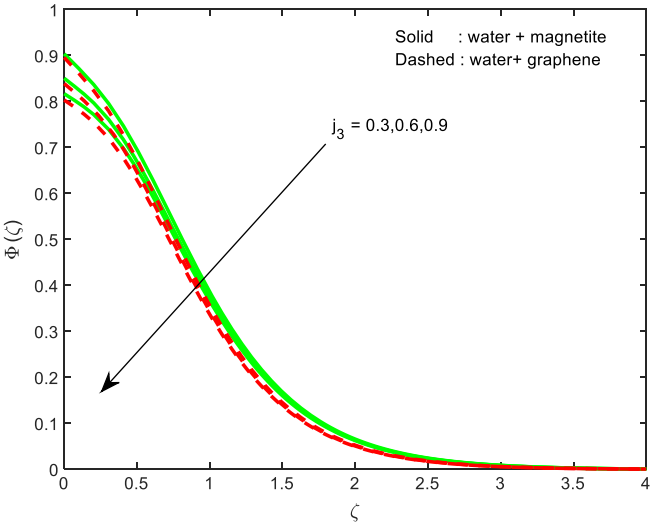

Fig. 13. Concentration profile for various values of concentration jump parameter j_3.

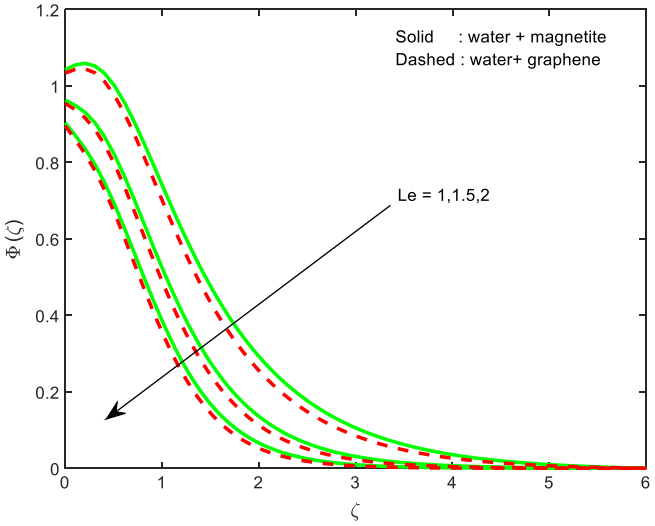

Fig. 14. Concentration profile for various values of Lewis number *Le*.

Table 2
Effect of various parameters on $f''(0)$, $-\theta'(0)$and $-\phi'(0)$ for the mixture of water and magnetite.

ϕ	*Nt*	*Nb*	j_1	j_2	j_3	*Le*	$f''(0)$	$-\theta'(0)$	$-\phi'(0)$
0.01							-0.875967	1.281648	0.322377
0.05							-0.938080	1.225730	0.320365
0.1							-0.991571	1.162464	0.322377
	0.1						-0.991571	1.162464	0.322377
	0.2						-0.991571	1.090804	-0.156461
	0.3						-0.991571	1.022743	-0.545024
		0.1					-0.991571	1.162464	0.322377
		0.2					-0.991571	1.071778	0.645183
		0.3					-0.991571	0.982329	0.752139
			0.3				-0.991571	1.162464	0.322377
			0.6				-0.732947	1.067327	0.270555
			0.9				-0.586166	0.998284	0.235931
				0.3			-0.991571	1.162464	0.322377
				0.6			-0.991571	0.872439	0.463977
				0.9			-0.991571	0.695397	0.551459
					0.3		-0.991571	1.162464	0.322377
					0.6		-0.991571	1.169280	0.249784
					0.9		-0.991571	1.173591	0.203874
						1	-0.991419	1.203844	-0.141120
						1.5	-0.991419	1.179337	0.124039
						2	-0.991419	1.162620	0.321750

4. Conclusion

Due to the numerous applications in manufacturing processes like lithium ion batteries, super capacitors, gas censors, water desalination, fuel cells, etc. In this study, we investigated the free convective heat and mass transfer in three-dimensional magnetohydrodynamic slip flow of a nanofluid over a slendering stretching sheet with thermophoresis and Brownian motion effects by considering the water based graphene and magnetite nanofluid. R-K-Felhberg-integration scheme is employed to resolve the altered governing nonlinear equations and results are presented through graphs and tables. The main lists of the determinations are as follows:

- Variable thickness in the stretching sheet causes to regulate the heat and mass transfer rates.
- Momentum, thermal and concentration boundary layers of water-graphene and water-magnetite nanofluids are not uniform.
- The heat and mass transfer rate is high in graphene dispensed

Table 3
Effect of various parameters on $f''(0)$, $-\theta'(0)$and $-\phi'(0)$ for the mixture of water and graphene.

ϕ	*Nt*	*Nb*	j_1	j_2	j_3	*Le*	$f''(0)$	$-\theta'(0)$	$-\phi'(0)$
0.01							-0.868158	1.283956	0.331300
0.05							-0.906959	1.235448	0.336819
0.1							-0.942829	1.178522	0.348779
	0.1						-0.942829	1.178522	0.348779
	0.2						-0.942829	1.108635	-0.126864
	0.3						-0.942829	1.041974	-0.513716
		0.1					-0.942829	1.178522	0.348779
		0.2					-0.942829	1.090898	0.667649
		0.3					-0.942829	1.004273	0.773376
			0.3				-0.942829	1.178522	0.348779
			0.6				-0.707089	1.085372	0.295228
			0.9				-0.570068	1.016777	0.295228
				0.3			-0.942829	1.178522	0.348779
				0.6			-0.942829	0.880978	0.490583
				0.9			-0.942829	0.700614	0.577627
					0.3		-0.942829	1.178522	0.348779
					0.6		-0.942829	1.185611	0.269088
					0.9		-0.942829	1.190062	0.219039
						1	-0.942607	1.217297	-0.112125
						1.5	-0.942607	1.194245	0.152575
						2	-0.942607	1.178656	0.348644

nanofluids when compared with the magnetite dispensed nanofluid.
- Slip plays a major role while controlling the velocity, temperature and concentration fields.
- Thermophoresis and Brownian motion parameters are effective controllers of heat and mass transfer rate.
- By controlling the temperature and concentration jump parameters, we can maintain the required heat transfer rate. This is very helpful in manufacturing industries.

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Electrical Characterisation of Polymer Blend Electrolyte System Doped with SiO_2

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Abstract: Composite polymer blend electrolyte system based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with $NaIO_4$ was prepared using solution cast technique. The effect ofnano sized silica (SiO_2) on the properties of Sodium ion conducting electrolyte was studied. The structural properties of these electrolyte films were examined by XRD studies. The XRD data revealed that the amorphous domains of polymer blend matrix increased with addition of nano particles. DC conductivity of the films was measured in the temperature range 303–398 K. The electrical conductivity increased with increasing dopant concentration, which is attributed to the formation of charge transfer complexes. The polymer complexes exhibited Arrhenius type dependence of conductivity with temperature. It was found that addition of SiO_2significantly improved the ionic conductivity. The total ionic transport number was evaluated by means of Wagner's polarization technique .Transport number for Sodium ion is ranged from 0.94 to 0.98 depending on the composition.

Keywords : Polymer blend electrolyte, DC conductivity, Transport number, Nano particle

I. INTRODUCTION

Solid polymer electrolytes have recently received considerable attention in view of their wide potential applications in various electrochemical devices such as solid state batteries, sensors, fuel cells, super- capacitors, electro chromic display devices etc. [1-3]. However, the low ionic conductivity of solid polymer electrolytes at ambient temperatures has limited their potential applications. The major efforts in this field have remained concentrated in developing new polymer electrolytes having high ionic conductivity and high mechanical, thermal and electrochemical stability [4-6].Various investigations have been performed by blending of polymers, cross linking, insertion of ceramic fillers and plasticization in order to enhance the ionic conductivity [7-8].The main advantages of the blend based polymer electrolytes are simplicity in preparation and easy control of physical properties by compositional change. Polymer blends often exhibit properties that are superior to the individual component polymers[9-10].

Most of the recent research efforts to improve the room temperature conductivity without the fall of mechanical and potential stability have been directed towards the addition of nanoscale ceramic fillers such as SiO_2,Al_2O_3,TiO2 and CeO_2 into polymer electrolytes[11-12].The nanosize fillers interact with the cations and anions and provide additional sites creating favourable high conducting pathways in the vicinity of filler grains for the migration of ions [13].The particle size of the filler is also expected to have a wide influence on the ionic conductivity of the composite polymer electrolytes. The conductivity increases with decrease in particle size i.e., increasing specific surface area of the ceramic fillers. In the present investigation, nano composite polymer electrolytes composing of PVA/PEG as host polymer ,$NaIO_4$ as a salt and SiO_2 as nano particle have been prepared .we report here the results of our investigation on the ionic conductivity, transport and electrochemical nature of polymer blend electrolyte films.

II. EXPERIMENTAL

Films (thickness ~100 μm) of pure blends of PVA+PEG and various compositions of complexed films of (PVA + PEG) with $NaIO_4$salt were prepared in the weight percent ratios (47.5:47.5:5), (45:45:10),(42.5:42.5:15) and (40:40:20) by solution cast technique using tetrahydrfuranas a solvent. $SiO_2$was used in small quantity (2 wt%) as a nano particle in these films.The solutions were stirred for 10-12 h to geta homogeneous mixture and were then, cast onto polypropylene dishes and evaporated slowly at ambient atmosphere. The final product was vacuum dried thoroughly

In order to investigate the nature of these polymer blend electrolyte films, X-ray diffraction studies were carried out usingHLG4/B-PC X-ray diffractometer with Cu Kα radiation and graphite monochromator at room temperature. The dc conductivity was measured by means of an in-house conductivity set-up [14] in the temperature range303-398K.The total ionic transport number was evaluated by means of Wagner's polarization technique [15].in this technique, freshly prepared polymer electrolyte films were polarized in the configuration Na/polymer electrolyte/C under a dc bias(step potential of 1.5V). The resulting current was monitored as a function of time.

III. RESULTS AND DISCUSSION

A. *X-ray diffraction*

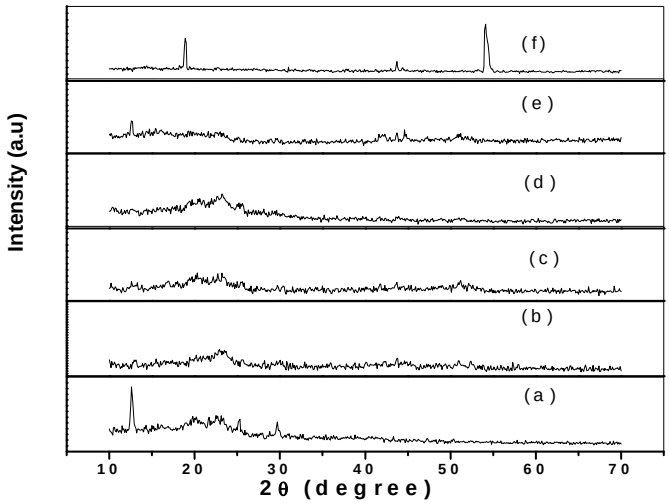

Fig 1. XRD patterns of(a) Pure PVA+PEG(b) PVA+PEG++$NaIO_4$(47.5 :47.5 :5)(c) PVA+PEG+$NaIO_4$+SiO_2 (47.5 :47.5 :5)(d) PVA+PEG+$NaIO_4$(42.5 :42.5 : 15) (e) PVA+PEG+$NaIO_4$+SiO_2 (42.5 :42.5 :15)(f) $NaIO_4$ salt.

Fig. 1 shows the XRD patterns of (PVA+PEG+$NaIO_4$),PVA+PEG+$NaIO_4$plasticizer and pure $NaIO_4$ films. Figure 1(a–f) shows peak intensity at $2\theta = 20^0$for pure blend film. The intensity of this peak decreases with increasing concentration of $NaIO_4$ which implies decrease of degree of crystallization and increase of amorphous nature. Hodge *et al* [16] established a correlation between intensity of the peak and degree of crystallinity. The peaks exhibit further decrease in intensity at higher concentrations of $NaIO_4$ salt in the polymer. This indicates a decrease in the crystalline phase with lowering of crystallite size of the polymer electrolyte. The crystalline peaks of 2θvalues at 15 and 62^0 corresponding to $NaIO_4$are absent in nanocomposite polymer bend complexed films. This amorphous nature results in greater ionic diffusivity and highionic conductivity, which can be observed in amorphous polymers having flexible back-bone [17-18]. This behaviour demonstrates that complexation between PVA,PEG,$NaIO_4$and nano particle occurs and takes place in the amorphous region

B. *Temperature dependent DC conductivity*

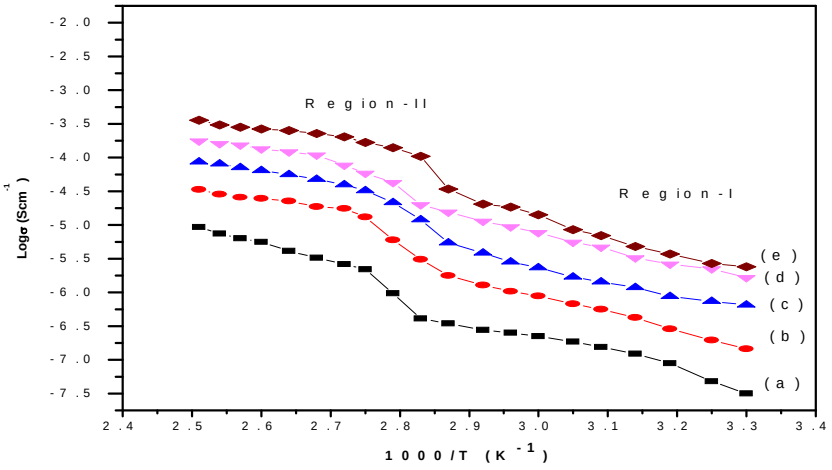

Fig 2. Temperature dependent conductivity of(a) (PVA+PEG)(50:50)(b) PVA+PEG++$NaIO_4$(47.5 :47.5 :5)(c) PVA+PEG+$NaIO_4$ +SiO_2 (47.5 :47.5 :5)(d) PVA+PEG+$NaIO_4$(42.5 :42.5 : 15)(e) PVA+PEG+$NaIO_4$+ SiO_2 (42.5 :42.5 :15)

Fig. 2 shows the variation of dc conductivity as a function of inverse temperature for different composition of (PVA+PEG+$NaIO_4$), (PVA+PEG+$NaIO_4$+SiO_2) polymer electrolyte in the temperature range of 303-398 K. From the plots it is clear that the conductivity is found to increase with increase of temperature in polymer blend as well as in all the compositions of (PEA+PEG+$NaIO_4$) polymer electrolyte. With the addition of nanoparticles ,the conductivity was found to increase when compared to $NaIO_4$ doped films. Nanoparticles penetrates the polymer matrix and establish attractive forces with the chain segments, these attractive forces reduce the cohesive force between the polymer chains and increases the segmental mobility ,which enhance the conductivity and the discharge time. The increase in degree of ionic segmental mobility and interaction between Na ions and the polymer chains induced the higher ionic conductivity in polymer electrolyte system. The particle size of SiO_2also influences the kinetics of polymers chain. This promotes localized amorphous regions and thus enhance the Na ions transport in the amorphous polymer electrolytes[19].The temperature –dependent conductivity plots follow an Arrhenius behaviour throughout with two regions having different activation energies. Similar behaviour has been observed in a number of other polymer blend electrolyte films [11, 20].
The conductivity σ may be expressed as

$$\sigma=\sigma_0 \exp(-E_a/kT) \quad \text{..... (1)}$$

where σ_0 is the pre-exponential factor, E_a, the activation energy, k, the Boltzmann constant and T is the absolute temperature.
The increase in the conductivity with temperature plots may be attributed to the transition from crystalline/semi-crystalline phase to amorphous phase. The increase in conductivity with temperature is interpreted in terms of a hopping mechanism between coordination sites, local structural relaxation and segmental motion of polymer [21]. As the amorphous region increases, however, the polymer chain acquires faster internal modes in which bond rotations produce segmental motion. This, in turn, favours the hopping interchain and intra-chain movements, and the conductivity of the polymer thus becomes high [22]. The activation energies evaluated from the slopes of log σ versus 1000/T plots, for both the regions are given in the Table 1. From the table it is clear that the activation energies in both the regions decrease with the increase of salt concentration in all the samples. Increase in the electrical conductivity and decrease in the activation energy values of polymer electrolytes can be explained on the basis that the polymer films are known to be a mixture of amorphous and crystalline region and the conductivity behaviour of such films may be dominated by the properties of the amorphous regions.

Table 1.DC conductivity and Activation energies of (PVA+PEG+$NaIO_4$) polymer electrolyte system at different temperatures

Polymer Electrolyte system (wt %)	Conductivity(Scm-^{1})	Activation Energy(E_a)	
	303 K	Region I (eV)	Region II (eV)
PVA+PEG (50:50)	3.05×10^{-8}	0.67	0.53
PVA+PEG+$NaIO_4$ (47.5 :47.5 :5)	1.48×10^{-7}	0.60	0.40
PVA+PEG+$NaIO_4$ + SiO_2(47.5 :47.5 :5)	6.47×10^{-7}	0.49	0.28
PVA+PEG+$NaIO_4$ (42.5 :42.5 :15)	1.68×10^{-6}	0.37	0.23
PVA+PEG+$NaIO_4$+SiO_2 (42.5 :42.5 :15)	2.51×10^{-6}	0.34	0.23

C. Transference numbers

The conductivity measurements are inadequate if performed without the information on the possible type of charge carriers. The transference numbers corresponding to ionic (t_{ion}) and electronic (t_{ele}) transport were evaluated using the Wagner's polarization

technique [14]. In this technique, the current is monitored as a function of time on the application of a fixed DC potentialof 1.5 V across the cell. The transference numbers were calculated using the following equation

$$t_{ele} = i_s/i_t \quad \text{..... (2)}$$

$$t_{ion} = 1 - \frac{i_s}{i_T} \quad \text{..... (3)}$$

where I_i is the initial current and I_f is the final residual current.

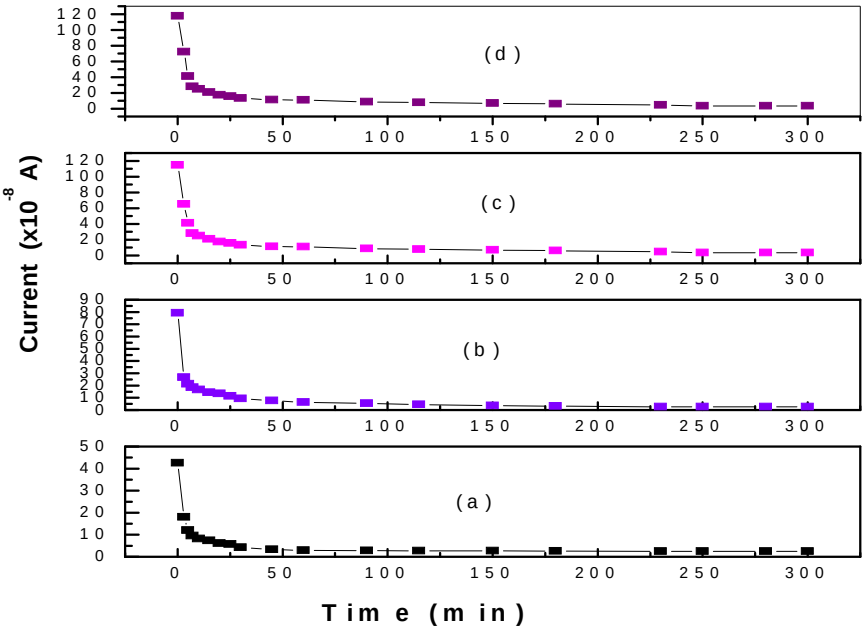

Fig.3 Current vs time plots of(a) PVA+PEG+$NaIO_4$ (47.5:47.5:5) (b) PVA+PEG+$NaIO_4$ +SiO_2 (47.5:47.5:5)(c) PVA+PEG+$NaIO_4$ (42.5:42.5:15) (d) PVA+PEG+$NaIO_4$+SiO_2(42.5:42.5:15)

Figure 3 shows the variation of current as a function of time upon the application of a DC voltage of 1.5 V across the (Na/electrolyte/C) cell. The transference numbers evaluated from the plots are given in Table 2. The ionic transference number was found to be in the range 0.94–0.98 in these polymer electrolyte systems. This suggests that the charge transport in these polymer electrolytes is predominantly due to ions, with negligible contribution from the electrons.

Table 2: Transference numbers of $NaIO_4$ doped (PVA + PEG) polymer blend films.

Polyblend electrolyte	Transference num-bers	
	t_{ion}	t_{ele}
PVA+PEG+$NaIO_4$ (47.5 :47.5 :5)	0.94	0.06
PVA+PEG+$NaIO_4$+ SiO_2 (47.5 :47.5 :5)	0.95	0.05
PVA+PEG+$NaIO_4$ (42.5 :42.5 : 15)	0.97	0.03
PVA+PEG+$NaIO_4$+SiO_2(42.5 :42.5 :15)	0.98	0.02

Nanocomposite polymer electrolytes thus offer an interesting alternative to other reported electrolyte system for room temperature solid –state batteries [23-25].

IV. CONCLUSIONS

The introduction of salts and nanoparticles has proved to be a convenient method to increase the ionic conductivity at ambient temperatures. The value of activation energy decreases with increasing do pant concentration and nanoparticles. The nanocomposite electrolyte films exhibit better performance, which indicates that such electrolytes are more suitable for fabricating sold-state batteries. The XRD study reveals the amorphous nature of the polymer electrolytes. The charge transport in these polymer electrolytes is predominantly due to ions, with negligible contribution from the electrons.

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Discharge Characteristics of Solid Polmer Blend Electrolyte Films

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Abstract: *Solid polymer blend electrolyte system films on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with DMF was prepared using solution cast technique. The effect of plasticizer (DMF) on the properties of Sodium ion conducting electrolyte was studied. Complexation of the polymer blend with salt was examined by XRD studies. DC conductivity of the films was measured in the temperature range 303–398 K. The electrical conductivity increased with increasing dopant concentration, which is attributed to the formation of charge transfer complexes. The polymer complexes exhibited Arrhenius type dependence of conductivity with temperature.. The total ionic transport number was evaluated by means of Wagner's polarization technique .Transport number for Sodium ion is ranged from 0.95 to 0.98 depending on the composition. Electrochemical cells with configuration Na / polymer electrolyte / (I_2+C+electrolyte) were fabricated. The discharge characteristics of the cell were studied under a constant load.*

Keywords: *Polymer electrolyte, DC conductivity, Transport number, Electrochemical cell*

Date of Submission: 21-12-2017 Date of acceptance: 03-01-2018

I. Introduction

Solid polymer electrolytes have been extensively studied in the past decades due to their wide potential applications in various electrochemical devices such as solid state batteries, sensors, fuel cells, [1-2]. The electrical conduction in polymer film has much importance due to the discovery of memory phenomenon and has wide applications now-a-days in thin film devices,[3-4].The major efforts in this field have remained concentrated in developing new polymer electrolytes having high ionic conductivity and high mechanical, thermal and electrochemical stability .Various investigations have been performed by blending of polymers, cross linking, insertion of ceramic fillers and plasticization in order to enhance the ionic conductivity [5-6]. Most of the recent research efforts to improve the room temperature conductivity without the fall of mechanical and potential stability have been directed towards the addition of plasticizer such as ethelyne carbonate (EC),prophlene carbonate (PC) and dibutyl pthalate into polymer electrolytes[7-8].The plasticizer interact with the cations and anions and provide additional sites creating favourable high conducting pathways in the vicinity of filler grains for the migration of ions [9]. In the present investigation, polymer electrolytes composing of PVA/PEG as host polymer ,$NaIO_4$ as a salt and dimethyl formamide(DMF) as plasticizer have been prepared .we report here the results of our investigation on the ionic conductivity, transport and discharge studies of polymer blend electrolyte films.

II. Experimental

Films (thickness ~100 μm) of pure blends of (PVA+PEG) and various compositions of complexed films of (PVA + PEG) with $NaIO_4$ salt were prepared in the weight percent ratios (47.5:47.5:5), (45:45:10), (42.5:42.5:15) and (40:40:20) by solution cast technique using tetrahydrfuran as a solvent. DMF was used in small quantity (2 ml) as a plasticizer in these films. The solutions were stirred for 8-10 h to get a homogeneous mixture and were then, cast onto polypropylene dishes and allowed to evaporate slowly at room temperature followed by vacuum drying.

The X-ray diffraction studies were carried out using seifert X-ray diffractometer at room temperature. The dc conductivity was measured by means of an in-house conductivity set-up [10] in the temperature range 303-398 K. The total ionic transport number was evaluated by means of Wagner's polarization technique [11].In this technique, freshly prepared polymer electrolyte films were polarized in the configuration Na/polymer electrolyte/C under a dc bias(step potential of 1.5V). The resulting current was monitored as a function of time. Electrochemical ells were fabricated with a configuration Na/ /(PVA+PEG+$NaIO_4$)/(I_2+C+electrolyte) and Na/ /(PVA+PEG+$NaIO_4$+DMF)/(I_2+C+electrolyte).Details regard-

ing the circuit and electrochemical cell design are given in [12].The open circuit voltage ,short circuit current and discharge time for the plateau region were measured.

III. Results and discussion

3.1. X-ray diffraction

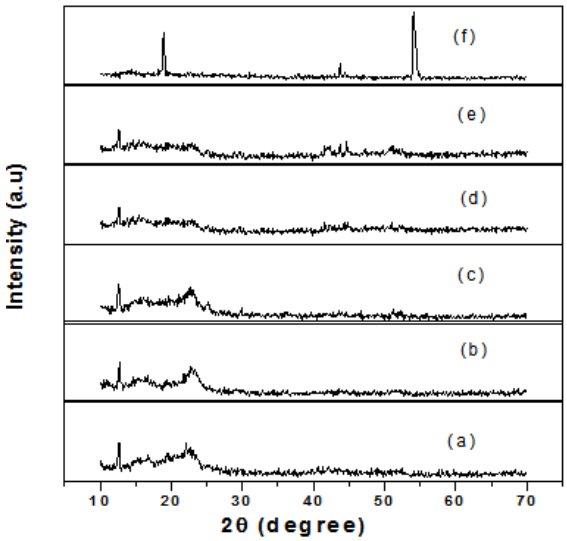


Fig 1. XRD patterns of (a) Pure PVA+PEG (b) PVA+PEG++$NaIO_4$ (47.5 :47.5 :5) (c) PVA+PEG+$NaIO_4$ + DMF (47.5 :47.5 :5) (d) PVA+PEG+$NaIO_4$ (42.5 :42.5 : 15) (e) PVA+PEG+$NaIO_4$ + DMF (42.5 :42.5 :15) (f) $NaIO_4$ salt.

To investigate the complication of Sodium salt with polymer blend XRD studies were performed. Fig. 1 shows the XRD patterns of (PVA+PEG+$NaIO_4$), (PVA+PEG+$NaIO_4$ +DMF) and pure $NaIO_4$ films. Figure 1(a–f) shows peak intensity at $2\theta = 23^0$ for pure blend film. The intensity of this peak decreases with increasing concentration of $NaIO_4$ which implies decrease of degree of crystallization and increase of amorphous nature. Hodge *et al* [13] established a correlation between intensity of the peak and degree of crystalline. The peaks exhibit further decrease in intensity at higher concentrations of $NaIO_4$ salt in the polymer. This indicates a decrease in the crystalline phase with lowering of crystallite size of the polymer electrolyte. The crystalline peaks of 2θ values at 18 and 54^0 corresponding to $NaIO_4$ are absent in nanocomposite polymer bend complexes films. This amorphous nature results in greater ionic diffusivity and high ionic conductivity, which can be observed in amorphous polymers having flexible back-bone [14-15]. This behaviour demonstrates that complication between PVA,PEG, $NaIO_4$ and plasticizer occurs and takes place in the amorphous phase.

3.2 Temperature dependent DC conductivity

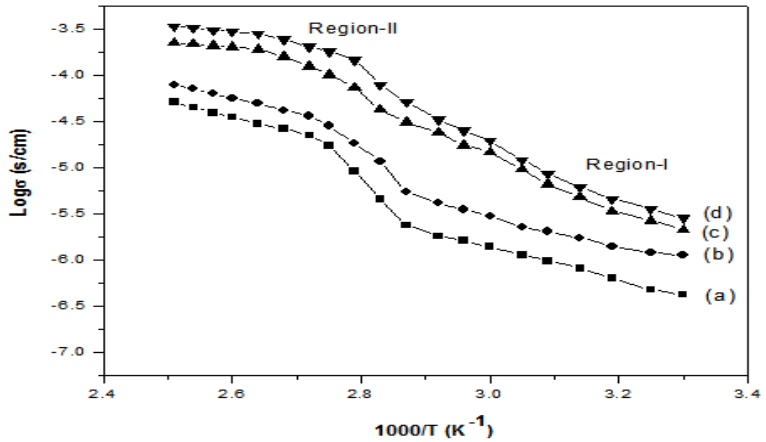


Fig 2. Temperature dependent conductivity of (a) PVA+PEG++$NaIO_4$ (47.5 :47.5 :5)(b) PVA+PEG+$NaIO_4$ +DMF (47.5 :47.5 :5) (c) PVA+PEG+$NaIO_4$ (42.5 :42.5 : 15)(d) PVA+PEG+$NaIO_4$ + DMF (42.5 :42.5 :15)

The variation of dc conductivity as a function of inverse temperature for different composition of $(PVA+PEG+NaIO_4)$, (PVA+PEG+$NaIO_4$+DMF) polymer electrolyte in the temperature range of 303-398 K is shown in the Fig 2. The conductivity is found to increase with increase of temperature in polymer blend as well as in all the compositions of (PEA+PEG+$NaIO_4$) polymer electrolyte. With the addition of plasticizer the conductivity was found to increase when compared to $NaIO_4$ doped films. Plasticizer penetrates the polymer matrix and establish attractive forces with the chain segments, these attractive forces reduce the cohesive force between the polymer chains and increases the segmental mobility which enhance the conductivity. The increase in degree of ionic segmental mobility and interaction between Na ions and the polymer chains induced the higher ionic conductivity in polymer electrolyte system.

The temperature –dependent conductivity plots follow an Arrhenius behaviour throughout with two regions having different activation energies

The conductivity σ may be expressed as

$$\sigma = \sigma_o \exp(-E_a/kT) \quad \text{..... (1)}$$

where σ_0 is the pre-exponential factor, E_a, the activation energy, k, the Boltzmann constant and T is the absolute temperature.

The increase in the conductivity with temperature plots may be attributed to the transition from crystalline/semi-crystalline phase to amorphous phase. The increase in conductivity with temperature is interpreted in terms of a hopping mechanism between coordination sites, local structural relaxation and segmental motion of polymer [16]. As the amorphous region increases, however, the polymer chain acquires faster internal modes in which bond rotations produce segmental motion. This, in turn, favours the hopping inter-chain and intra-chain movements, and the conductivity of the polymer thus becomes high [17].

The activation energies evaluated from the slopes of log σ versus 1000/T plots, for both the regions are given in the Table 1. From the table it is clear that the activation energies in both the regions decrease with the increase of salt concentration in all the samples. Increase in the electrical conductivity and decrease in the activation energy values of polymer electrolytes can be explained on the basis that the polymer films are known to be a mixture of amorphous and crystalline region and the conductivity behaviour of such films may be dominated by the properties of the amorphous regions.

Table 1. DC conductivity and Activation energies of (PVA+PEG+$NaIO_4$) polymer blend electrolyte system at different temperatures

Polymer Electrolyte system (wt %)	Conductivity(Scm^{-1})	Activation Energy(E_a)	
	303 K	Region I (eV)	Region II (eV)
PVA+PEG+$NaIO_4$ (47.5 :47.5 :5)	1.48×10^{-7}	0.61	0.40
PVA+PEG+$NaIO_4$ + DMF (47.5 :47.5 :5)	4.15×10^{-7}	0.36	0.35
PVA+PEG+$NaIO_4$ (42.5 :42.5 :15)	1.68×10^{-6}	0.37	0.24
PVA+PEG+$NaIO_4$ + DMF (42.5 :42.5 :15)	2.11×10^{-6}	0.22	0.21

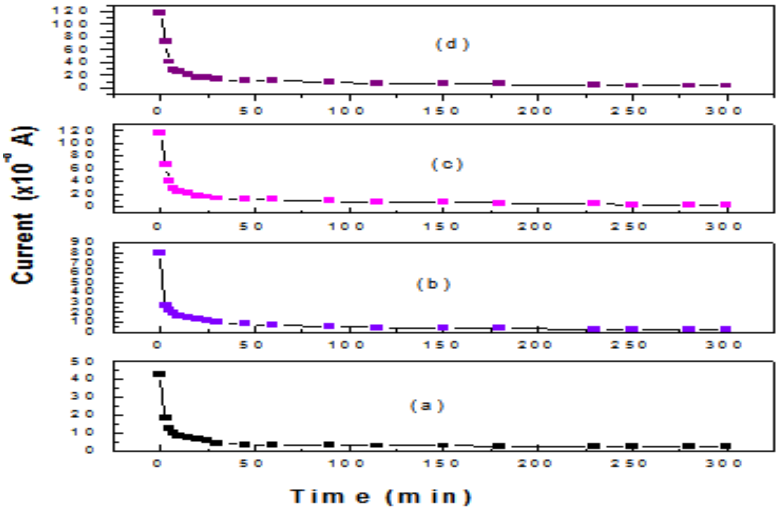
3.4. Transference numbers

The transference numbers corresponding to ionic (t_{ion}) and electronic (t_{ele}) transport were evaluated using the Wagner's polarization technique [10]. In this technique, the current is monitored as a function of time on the application of a fixed DC potential of 1.5 V across the cell. The transference numbers were calculated using the following equation

$$t_{ele} = i_s/i_t \quad \text{..... (2)}$$

$$t_{ion} = 1 - \frac{i_s}{i_T} \quad \text{..... (3)}$$

where I_i is the initial current and I_f is the final residual current.



ig.3 Current vs time plots of (a) PVA+PEG+$NaIO_4$ (47.5:47.5:5) (b) PVA+PEG+$NaIO_4$ + DMF (47.5:47.5:5) (c) PVA+PEG+$NaIO_4$ (42.5:42.5:15) (d) PVA+PEG+$NaIO_4$ + DMF (42.5:42.5:15)

Figure 3 shows the variation of current as a function of time upon the application of a DC voltage of 1.5 V across the (Na/electrolyte/C) cell. The transference numbers evaluated from the plots are given in Table 2. The ionic transference number was found to be in the range 0.95–0.98 in these polymer electrolyte systems. This suggests that the charge transport in these polymer electrolytes is predominantly due to ions, with negligible contribution from the electrons.

Table 2: Transference numbers of $NaIO_4$ doped (PVA + PEG) polymer blend films.

Polyblend electrolyte	**Transference numbers**	
	t_{ion}	**t_{ele}**
PVA+PEG+$NaIO_4$ (47.5 :47.5 :5)	**0.95**	**0.06**
PVA+PEG+$NaIO_4$+ DMF (47.5 :47.5 :5)	**0.95**	**0.05**
PVA+PEG+$NaIO_4$ (42.5 :42.5 : 15)	**0.97**	**0.03**
PVA+PEG+$NaIO_4$+ DMF (42.5 :42.5 :15)	**0.98**	**0.02**

IV. Electrochemical cell discharge characteristics

Solid state electrochemical cells were fabricated with the configuration (Anode)/polymer electrolyte/(cathode).Discharge characteristics of the cell for a constant load of 100 KΩ were evaluated at room temperature and are shown in Fig.4.The initial sharp decrease in the voltage in these cells may be due to polarization and the formation of thin layer of sodium salt at the electrode-electrolyte interface. The open circuit voltage (OCV),short circuit current(SCC) and other all parameters of these cells are listed in Table 3.The data indicate that the cell parameters are better in the cell with with the plasticizer. This suggests that plasticized polythene electrolyte cell exhibit improved performance and better stability than the pure polymer counterparts.Plasticized polymer electrolytes thus offer an interesting alternative to other reported electrolyte system for room temperature solid –state batteries .

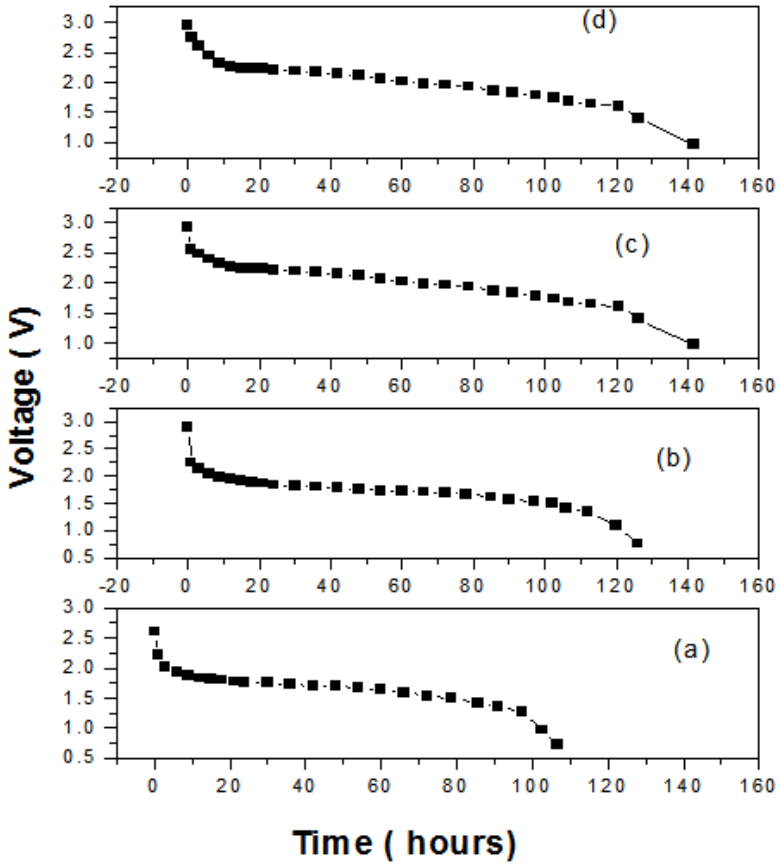


Fig. 4: Discharge characteristics of solid state electrochemical cell with the complexation
(a) Na/PVA+PEG+$NaIO_4$ (47.5 :47.5 :5) / (I_2+C+electrolyte)
(b) Na/PVA+PEG+DMF+$NaIO_4$ (47.5 :47.5 :10)) / (I_2+C+electrolyte)
(c) Na/PVA+PEG+$NaIO_4$ (42.5 :42.5 : 15)/(I_2+C+electrolyte)
(d) Na/PVA+PEG+DMF+$NaIO_4$ (42.5 :42.5 :15)/(I_2+C+electrolyte)
polymer electrolyte system.

Table-3: Various cell parameters of Na/(PVA+PEG+$NaIO_4$ + Plasticizer) / (I_2 + C+ Plasticizer) polymer electrolyte cell system

Cell parameters	**(PVA+PEG+$NaIO_4$) (47.5: 47.5:5)**	**(PVA+PEG+$NaIO_4$ + Plasticizer) (47.5:47.5:5)**	**(PVA+PEG+NaIO4) (42.5 : 42.5 : 15)**	**(PVA+PEG+NaIO4 + Plasticizer) (42.5:42.5:15)**
Open circuit voltage (V)	2.61	2.89	2.92	2.98
Short circuit current (μA)	814	1017	1246	1263
Effective area of cell $(cm)^2$	1.34	1.34	1.34	1.34
Cell weight (grams)	1.40	1.42	1.39	1.41
Time for plateau region (h)	102	120	134	138
Current density $(\mu A/cm^2)$	607	758	929	942
Power density (W/Kg)	1.52	2.07	2.62	2.67
Energy density (Wh/Kg)	154	248	320	368
Load $(K\Omega)$	100	100	100	100

V. Conclusions

The introduction of salts and plasticizer has proved to be a convenient method to increase the ionic conductivity at ambient temperatures. The value of activation energy decreases with increasing dopant concentration and plasticizer. The XRD study reveals the amorphous nature of the polymer electrolytes. The charge transport in these polymer electrolytes is predominantly due to ions, with negligible contribution from the electrons. The plasticized electrolyte films exhibit better performance, which indicates that such electrolytes are more suitable for fabricating sold-state batteries.

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WHY ENTREPRENEURS ARE IMPORTANT FOR THE ECONOMIC DEVELOPMENT-A STUDY

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ABSTRACT

Economic development is the process by which a nation improves the economic, political, and social well-being of its people and also the growth of the standard of living of a nation's people from a low-income (poor) economy to a high-income (rich) economy. Economic development is a policy intervention endeavor with aims of improving the economic and social well-being of people where as economic growth is a phenomenon of market productivity and rise in GDP. Consequently, as economist Amartya Sen points out, "economic growth is one aspect of the process of economic development".

Entrepreneurs occupy a central position in a market economy. For this, the entrepreneurs who serve as the spark plug in the economy's engine, activating and stimulating all economic activity. The economic success of nations worldwide is the result of encouraging and rewarding the entrepreneurial instinct. With the entrepreneurial energy, creativity and motivation that trigger the production and sale of new products and services. It is the entrepreneur who undertakes the risk of the enterprise in search of profit and who seeks opportunities to profit by satisfying as yet unsatisfied needs.

A society is prosperous only to the degree to which it rewards and encourages entrepreneurial activity because it is the entrepreneurs and their activities that are the critical determinant of the level of success, prosperity, growth and opportunity in any economy. The most dynamic societies in the world are the ones that have the most entrepreneurs, plus the economic and legal structure to encourage and motivate entrepreneurs to greater activities

This paper provides an overview of the role and importance of entrepreneur in the economic development.

Key words: economic development, economic growth, entrepreneurial energy, entrepreneurial activity

INTRODUCTION:

Economic development is the process by which a nation improves the economic, political, and social well-being of its people and also the growth of the standard of living of a nation's people from a low-income (poor) economy to a high-income (rich) economy. Economic development is a policy intervention endeavor with aims of improving the economic and social well-being of people where as economic growth is a phenomenon of market productivity and rise in GDP.

Fig. 1

Entrepreneurs play an important role in the economic growth of a nation. They act as an innovator, generator of employment, supplement and complement of economic growth and bring about the social stability and to help in achieving balanced regional development of industries, export promotion and import substitution. Entrepreneur's contribution to the economy is of immense value. An economy is much dependent upon the performance level of its entrepreneur. He or she plays a vital role in the growth of the national income as well as raising the per capita income of the people.

More than any other member of our society, entrepreneurs are unique because they are re capable of bringing together the money, raw materials, manufacturing facilities, skilled labor and land or buildings required to produce a product or service and also they are capable of arranging the marketing, sales and distribution of that product or service.

Entrepreneurs are optimistic and future oriented and they believe that success is possible and are willing to risk their resources in the pursuit of profit. They are fast moving, willing to try many different strategies to achieve their goals of profits. And they are flexible, willing to change quickly when they get new information. Entrepreneurs are skilled at selling against the competition by creating perceptions of difference and uniqueness in their products and services.

REVIEW OF LITERATURE:

Bluster (2013)[1], stated that, the economic development as the method of creating wealth by the gathering of human, financial capital, physical and natural resources to produce marketable goods and services.

Smallbone and Welter (2014)[2], stated that, the entrepreneurs contribute to economic development in terms of job creation, innovation and external income generation depending upon priorities and different stage of market reform. The authors suggested direct support to SMEs to overcome immediate difficulties to strengthen their potential for the development and growth.

Vishal Jain (2015)[3], describes how the Indian family business and its entrepreneurial spirit play an important role in India's growth.

Aditya Malkani (2017)[4], describes that, the Indian entrepreneurs who were previously compelled to migrate to the western world to seek investment and world leading technology now have access to both at home, with global industry and academia both looking very seriously at India for opportunities to collaborate.

Rahul Baijal (2018)[5], stated that, Entrepreneurs can change the way we live and work. If successful, their revolutions may improve our standard of living. In short, in addition to creating wealth from their entrepreneurial ventures, they also create jobs and the conditions for a flourishing society.

OBJECTIVES OF THE STUDY:

1. To study the role of an entrepreneur in the economic development
2. To examine the importance of an entrepreneur in the economic development

METHODOLOGY OF THE STUDY:

The data and information has been collected from secondary sources like, reputed journals, magazines, business newspapers, periodicals, reports and websites. Further, interviews and lectures in related area were also taken into consideration for the study.

SIGNIFICANCE OF THE STUDY:

The entrepreneur is essential for the economic development of a country. The progress of a country will depend upon his skill and talent as well as hard work to deliver necessary goods and services required by the citizens of the country. An economy is much dependent upon the performance level of its entrepreneur. The entrepreneur plays a vital role in the growth of the national income as well as raising the per capita income of the people.

Entrepreneur's contribution to the economy is of immense value. He or she is indispensable to the economic growth of the country. His or her products are valuable to the overall development of the society.

People need their products. They simply cannot do without them. Ours is a consumer society now. Even in the developing countries consumerism is gaining ground. Developed countries anyway thrive on consumerism. Naturally, the role of an entrepreneur is of much significance in generating products valuable for the comforts and luxurious living of the people of a particular country.

Fig. 2

Entrepreneurs who are business leaders look for ideas and put them into effect in nurturing the economic growth and development. They play the most important role in the economic growth and development of Indian economy. An entrepreneur plays a pivotal role not only in the development of industrial sector of a country but also in the development of farm and service sector.

The major roles played by an entrepreneur in the economic development of an economy are as follows:

1. Promotes capital formation

Fig. 3

Entrepreneurs promote capital formation by mobilizing the idle savings of our citizens. They employ resources for setting up their enterprises. Such types of entrepreneurial activities lead to value addition and creation of wealth, which is very essential for the industrial and economic development of India.

2. Employment generation

Fig. .4

Entrepreneurs provide instant large-scale employment to the unemployed which is an unending problem of India. Small entrepreneurs provide self employment to artisans, technically qualified persons and professionals. As these enterprises grow, they keep providing direct and indirect employment opportunities to many more. In this way, entrepreneurs clear the path towards economic development of our country.

3. Balanced regional development

Fig. 5

Entrepreneurs promote development of industries. They help to remove regional disparities by industrializing rural and backward areas. The growth of industries and business in these areas lead to a large number of public benefits like road transport, health, education, entertainment and etc. They help to reduce the problems of congestion, population in cities by providing employment and incomes to them. They help to improve the standard of living in sub-urban and rural areas.

4. Reduces concentration of economic power

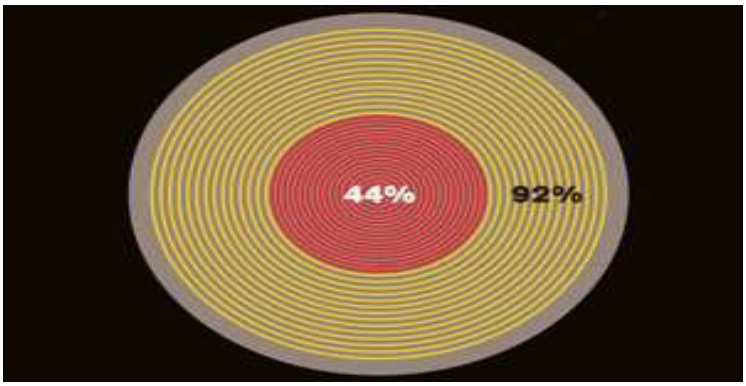

Fig. 6

Industrial development normally leads to concentration of economic power in the hands of a few individuals which results in the growth of monopolies. Entrepreneurs contribute towards the development of society by reducing concentration of income and wealth.

5. Wealth creation and distribution

Fig. 7

It stimulates impartial redistribution of wealth and income in the interest of the country to more people and geographic areas, thus giving benefit to larger sections of the society. Entrepreneurial activities also ensure equitable distribution of income and wealthy by inculcating the spirit of entrepreneurship amongst people thereby providing them self employment with limited resources.

6. Increasing GDP and per capita income

Fig. 8

Entrepreneurs are always looking out for opportunities. They encourage effective resource mobilization of capital and skill, bring in new products and services and develops markets for growth of the economy. In this way, they help increasing gross national product as well as per capita income of the people in our nation.

7. Improvement in the standard of living

Fig. 9

Entrepreneurs adopt latest innovations in the production of wide variety of goods and services in large scale that too at a lower cost. This enables the people to avail better quality goods at lower prices which results in the improvement of their standard of living.

8. Promotes country's export trade

Fig. 10

Entrepreneurs earn valuable foreign exchange through increased exports. They produce goods and services in large scale for the purpose earning huge amount of foreign exchange from export. This ensures economic independence and development.

9. Induces backward and forward linkages

Fig. 11

Entrepreneurs work in an environment of changing technology and try to maximise profits by innovation. This induces backward and forward linkages which stimulate the process of economic development in the country.

10. Facilitates overall development

Fig. 12

Entrepreneurs act as catalytic agent for change which results in chain reaction. Once an enterprise is established, the process of industrialization is set in motion. This unit will generate demand for various types of units required by it and there will be so many other units which require the output of this unit. This leads to overall development of an area due to increase in demand and setting up of more and more units.

IMPORTANCE OF AN ENTREPRENEUR IN THE ECONOMIC DEVELOPMENT:

Entrepreneurs occupy a central position in a market economy. For this, the entrepreneurs who serve as the spark plug in the economy's engine, activating and stimulating all economic activity. The economic success of nations worldwide is the result of encouraging and rewarding the entrepreneurial instinct. With the entrepreneurial energy, creativity and motivation that trigger the production and sale of new products and services. It is the entrepreneur who undertakes the risk of the enterprise in search of profit and who seeks opportunities to profit by satisfying as yet unsatisfied needs.

Fig. 13

Entrepreneurs seek disequilibrium--a gap between the wants and needs of customers and the products and services that are currently available. The entrepreneur then brings together the factors of production necessary to produce, offer and sell desired products and services. They invest and risk their money--and other people's money--to produce a product or service that can be sold at a profit. Entrepreneurs are optimistic and future oriented and also they believe that, success is possible and are willing to risk their resources in the pursuit of profit. They are fast moving, willing to try many different strategies to achieve their goals of profits and also they are flexible, willing to change quickly when they get new information.

Entrepreneurs are skilled at selling against the competition by creating perceptions of difference and uniqueness in their products and services. They continually seek out customer needs that the competition is not satisfying and find ways to offer their products and services in such a way that what they're offering is more attractive than anything else available.

Entrepreneurs are extremely important for the development because success is vital to the success of the nation. To help you develop a better business, one that contributes to the health of the economy, Entrepreneurs can change the way we live and work. If successful, their innovations may improve our standard of living, and in addition to creating wealth with their entrepreneurial ventures, they also create jobs and the conditions for a prosperous society

Entrepreneur's contribution to the economy is of immense value. He or she is indispensable to the economic growth of the country. His or her products are valuable to the overall development of the society. Entrepreneur has to invest in what is required for the economy. Entrepreneurs occupy a central position in a market economy. For this the entrepreneurs serve as the spark plug in the economy's engine, activating and stimulating all economic activity. The economic success of nations worldwide is the result of encouraging and rewarding the entrepreneurial instinct.

HOW DOES AN ENTREPRENEUR STIMULATE THE ECONOMY

The entrepreneur who is a business leader looks for ideas and puts them into effect in fostering economic growth and development. Entrepreneurship is one of the most important input in the economic development of a country. The entrepreneur acts as a trigger head to give spark to economic activities by his entrepreneurial decisions. He plays a pivotal role not only in the development of industrial sector of a country but also in the development of farm and service sector. The entrepreneur stimulates the economy in the following ways.

(1). **Mobilization of local resources:**

Entrepreneurs help to mobilize and utilize local resources like small savings and talents of relatives and friends, which might otherwise remain idle and unutilized. Thus they help in effective utilization of resources.

(2). **Optimization of capital:**

Entrepreneurs aim to get quick return on investment. They act as a stabilizing force by providing high output capital ratio as well as high employment capital ratio

(3). Social advantage:

Entrepreneurs help in the development of the society by providing employment to people paves for independent living. They encourage democracy and self-governance. They are adept in distributing national income in more efficient and equitable manner among the various participants of the society.

(4). Growth of capital market:

Entrepreneurs raise the money for running their business through shares and debentures. Trading of shares and debentures by the public with the help of financial services sector leads too capital market growth.

(5). Growth of infrastructure:

The infrastructure of any country determines the economic development of a country. Entrepreneurs by establishing their enterprises in rural and backward areas influence the government to develop the infrastructure of those areas.

(6). Economic integration:

Entrepreneur reduces the concentration of power in a few hands by creating employment opportunities and through equitable distribution of income. Entrepreneurs promote economic integration in the country by adopting certain economic policies and laws framed by the government. They help in removing the disparity between the rich and the poor by adopting the rules and regulations framed by the government for the effective functioning ofo business in the country.

CONCLUSION:

“An entrepreneur searches for change, responds to it and exploits opportunities. Innovation is a specific tool of an entrepreneur hence an effective entrepreneur converts a source into a resource”- Peter Drucker, Management Guru.

The entrepreneur plays an important role in economic and industrial development of any country whether developed or developing. Indian entrepreneurs are more about overcoming barriers, obstacles, inspiring and surmount in their fields. They faced many obstacles in the way of entrepreneurial achievement. It is difficult to dampen the Indian entrepreneurial spirit. It has grown and competed in the global market. Entrepreneurs have shown their ability to adapt to the changing economic environment and deal positively with the uncertainties in the market place.

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Consumers' perception towards GST Rates in India

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ABSTRACT

Reforms are a continuous process as and when a new reform or bill comes and a new law is imposed, it surely leaves its impact especially on the common man. It is ultimately the common man who is directly or indirectly affected by the implementation of any new tax. GST or Goods and Services Tax as the name implies, it is an indirect tax applied both on goods and services at a uniform rate. A single form of tax known as GST has applied throughout the country.

Goods and Services Tax (GST) – A new law, a new tax will bring with it new challenges to face that need to be tackled with utmost care. The GST bill covers the goods and services tax and shall be the biggest indirect tax reform providing a uniform and simplified way of indirect taxation in India.

After a lot of deliberation the GST council has finalized the rates for all the goods and major service categories under various tax slabs. The tax rate under GST are set at 0%, 5%, 12%, 18% and 28% for various goods and services and almost 50% of goods & services comes under 18% tax rate. A bundle of indirect taxes will get replaced by GST. But how is our life going to change post GST? and also to see how GST on some day-to-day good and services will have an impact on an end user's pocket.

Through this article, let we see how GST will affect our daily lives as citizens of this great democracy. Though it is called as 'Good and Simple Tax', it is noteworthy that instead of one single GST rate, variety of goods and services will be taxed at different rates. As there are several tax rates, we need to see if it would really make our life simple.

This paper sets out to analyze the effect of the impending implementation of Goods and Services Tax (GST) in India and its impact on common man's budget and affect consumers' money.

1. Introduction

The introduction of goods and services tax as a single taxation system is considered to be a major tax reform in the country. All most all the sectors of the economy are now experiencing the effects of goods and services tax. Consumers are no way an exception to the aftermath of the goods and services tax. Different tax experts and economists have given their opinion on the long term benefits of goods and services tax for India. It is necessary to understand the consumers' opinion regarding GST. Thus, there is a need to study the consumer perception regarding the GST rates now in India.

A consumer might not be required to do anything under GST and is also the last person in the value chain involving supply of goods and services but all this tax transformation is undertaken for his betterment only. There is an inter relationship between a consumer, business and indirect taxes. One of the leading revenue generators to the government is indirect taxes, a tax that is collected and deposited by a business but eventually passed on to the person who bears the ultimate economic burden of the tax i.e., the consumer.

2. Review of literature

Anshu Ahuja (2017)[1], in the research paper titled "Perception of people towards goods and services tax" found that consumers are satisfied that goods and services tax will reduce the tax evasion in the country and will increase the transparency in the tax structure. He further suggested that government should give some relaxation to farmers and small scale business to avoid the adverse impact of goods and services tax on their income level.

Gowtham Ramkumar (2017)[2], in his study titled "Impact of GST on consumer spending ability in Chennai City" concluded that consumers are left with less money after GST, rise in inflation level and fall in prices of certain goods after GST implementation. He further concluded that GST rates will have a significant impact on the spending ability of the consumers and suggested that benefits of input tax credit must be transferred by the companies to the consumers.

Manoj Kumar Agarwal (2017)[3], in his research paper titled "People's perception towards GST – An empirical study" found that people feel that GST has increased the legal compliances and it will increase the tax collection of the government. He further found that GST has increased the tax burden of businessmen and suggested that efforts should be made on the part of the government to ensure people have a proper understanding of the goods and services tax implemented in India.

3. Need of the study

Most of the consumers are unaware of GST applicability on various goods and services and also they don't know the tax rates before GST and after GST. Not only that, some retailers are engaged in cut practices and they are fooling the consumers by charging GST on MRP based products. MRP includes GST but retailers are taking advantage of consumer's confusion over GST. Hence, there is a need to provide the awareness to the consumers on GST rates.

4. Objectives of the study

1. To study the consumers perception towards GST rates in India
2. To furnish the information regarding GST rates to the consumers.

5. Research methodology

The present study is totally based on secondary data. The relevant data is collected from newspapers, research studies, reputed journals, books and websites etc.

When the nationwide goods and services tax (GST) was introduced a year ago, it was accompanied by both fear and hope. The fear was that it would be used as an opportunity by firms to raise prices while the hope was that it would lead to a convergence of prices across states and cities. One year later, the evidence on GST is mixed.

The new GST regime brought with it a slew of overarching impacts on a multitude of commercial sectors. The consolidation of various levies into a singular structure has affected almost every aspect of consumption in our lives. Hence, we are doing a series of blogs about the impact of GST rates on consumers.

TABLE 1: DAILY NEED ITEMS

Items	GST Rate %	< >	Previous Effective Rate %
CHEAPER GOODS			
Hair oil	18	<	26

Tooth paste	18	<	26-28
Soaps	18	<	26-28
Spectacles lens	12	<	18.5
Steel Utensils	5	<	18.5
Namkeen	12	<	26
Tooth Power	12	<	26
Led light	12	<	26
Brooms sticks	5	<	18
Milk beverage	12	<	26
Mineral water	18	<	26-28
Rusk & Toasted bread	5	<	5-12.5

Source : The Economic Times, July 1st, 2018

The tax rates on all the daily need items were come down after implementation of GST compare to VAT rates.

TABLE 2 : DEARER GOODS

Items	GST Rate %	< >	Previous Effective Rate %
Bread, butter, ghee & cheese	12	>	5
Agarbatti	12	>	0
Jam & jellies	18	>	12
Chocolates	28	>	25-26
Pasteries & cake	18	>	11-15
Instant coffee	28	>	26
Sanitary napkins	12	>	5-6
Razor	28	>	26
Shaving cream, hair cream	28	>	26

Source : The Economic Times, July 1st, 2018

The tax rate on all the dearer goods has increased compare to VAT rate.

TABLE 3: UTILITY BILLS

Item	GST Rate %	< >	Previous Effective Rate %
Telecom	18	>	15
Insurance	18	>	15
Coaching class	18	>	15
Jewellery	3	>	2.5
Leather bags	28	>	6
Wrist watches	28	>	26
Furniture	28	>	26

Source : The Economic Times, July 1st, 2018

All the utility bills were charged on higher rate of tax under GST compare to VAT rates

TABLE 4 : LEISURE

Item	GST Rate %	< >	Previous Effective Rate %
Movie tickets(> Rs.100)	28	>	22-23
Five star restaurants	28	>	18
A/C Alcohol serving restaurants	18	<	22
Air tickets (economy)	5	<	6
Average room tariff (Rs. 2,500-7,500)	18	<	28
Average room tariff (> Rs. 7,500)	28	>	28-30

Source : The Economic Times, July 1st, 2018

The tax rates on movie tickets and five star restaurants has increased around 5-6 percent and on air tickets economy class has a little decrease.

TABLE 5: CONSUMER DURABLE

Item	GST Rate %	< >	Previous Effective Rate %
AC	28	>	25-26
Washing machine	28	>	25-26
Coolers	28	>	23-24
Refrigerators	28	>	24-27
Celle phones	12	>	6

Source : The Economic Times, July 1st, 2018

The tax rates on all most all the consumer durables has increased under GST

TABLE 6 : VEHICLES

Item	GST Rate %	< >	Previous Effective Rate %
Bicycle	12	<	18.5
Two-wheelers	28	>	27-30
Small petrol car	29	>	27-30
Small diesel car	31	>	27-30
Large car (< 1.5 L engine)	43	>	43-47
Large car (> 1.5 L engine)	43	>	47-51
SUVs (> 1.5 L clearance > 170 mm)	43	>	45-54
Rubber tyres	28	>	18.5

Source : The Economic Times, July 1st, 2018

Regarding vehicles, the tax rate on bicycle only has come down but all the vehicles using fuel has increased, the highest rate increase on SUV vehicles it is almost 11 percent and the tax on rubber types has increased 9 to10 percent

TABLE 7: INDUSTRIALS

Item	GST Rate %	< >	Previous Effective Rate %
Cement	28	>	25-27
Bulding briks	5	<	18.5
Coal	5	<	11
Paints	28	>	16
Ceramic tiles	28	>	26
Fertilizers	5	<	18.5

Source : The Economic Times, July 1st, 2018

The tax rate on cement, paints and ceramic tiles has increased and on building briks, coal and on fertilizers the rate has lowered.

TABLE 8 : DAILY CONSUMPTION ITEMS

CHEAPER	GST rate	Pre-GST rate	COSTLIER	GST rate	Pre-GST rate
Tea	5%	6%	Preserved vegetables	18%	0%
Bakery products	5%	12%	Burrer, Ghee, Cheese	12%	6%
Vegetable oils	5%	12%	Dry fruits	12%	6%
Refined sugar	18%	26%	Frozen meats	12%	6%
Milk beverages	12%	26%	Branded pannier	5%	0%
Namkeen/ Bhujia	12%	26%	Branded cereals	5%	0%

Source : The Economic Times, July 1st, 2018

The tax rate on edible items such as bakery products, oils, sugar, namkeen and milk beverages has decreased and on butter, ghee, cheese, dry fruits, frozen meats, brand pannier and cereals has increased and they become costlier

TABLE 9: PERSONAL HYGIENE ITEMS

CHEAPER	GST rate	Pre-GST rate	COSTLIER	GST rate	Pre-GST rate
Tooth paste	18%	26%	Deodorants	28%	26%
Soap	18%	26%	Perfumes	28%	26%

Hair oil	18%	26%	Shaving cream & After shave	28%	26%
Toilet paper	18%	26%	Skin care items	28%	26%
Detergents	18%	26%	Skin care items & sun screens	28%	26%
			Shampoo & Hair dyes	28%	26%

Source: The Economic Times, July 1st, 2018

Under personal hygiene items the tax rate has reduced on the items such as, tooth paste, soap, hair oil, and detergents but on the deodorants, perfumes, shaving cream, after shave lotion skin care items, shampoo and hair dyes has increased.

TABLE 10: LIFE STYLE ITEMS

Cheaper	GST rate	Pre-GST rate	Costlier	GST rate	Pre-GST rate
Sports items	12%	18.5%	Leather bags	28%	6%
Fitness supplements	18%	26%	Cell phones	18%	6%
			Wrist watches	28%	26%

Source: The Economic Times, July 1st, 2018

Under life style items the tax rate has decreased only on sports items and on fitness supplements but an increase on leather bags is 22 percent, on cell phones it is 12 percent and on wrist watches it is 2 percent.

TABLE 10: CONSUMER DURABLES AND HOME APPLIANCES

CHEAPER	GST rate	Pre-GST rate	COSTLIER	GST rate	Pre-GST rate
Broomsticks	5%	18%	Agarbathi	5%	0%
Candles	12%	26%	Hot plates/induction stoves	28%	19%
Aluminum utensils	12%	19%	Plastic products	28%	19%
Iron/steel/ copper articles	15%	19%	Air Conditioners/ Refrigerators	28%	26%
LED lights	12%	26%	Wooden furniture	28%	26%

Source: The Economic Times, July 1st, 2018

The tax rate on consumer durable goods and home appliances such as aluminum utensils, steel and copper plates, LED lights has decreased but on agarbathi, plastic products, air conditioners, refrigerators and wooden furniture become costlier

TABLE 11: FINANCIAL SERVICES

Product type	Applicable on	GST rate	Pre-GST rate
Term policy	Premium payable	18%	15%
Unit linked policy	All applicable charges	18%	15%
Riders	Premium payable	18%	15%
Health insurance policy	Premium payable	4.5%	3.75%
Endowment policy	Premium payable-Regular premium	2%	1.9%
Single premium annuity plan	Premium payable	1.8%	1.7%

Source: The Economic Times, July 1st, 2018

As against the earlier service tax rate of 15% on banking, insurance and capital market transactions, the rate now under GST will be 18%. and on financial transactions vide ATMs, NEFT / RTGS / IMPS, debit card, credit card, e-wallets, will cost you more.

Paying insurance premiums will also prove costly. Even investors in mutual funds will have to bear a greater cost. While buying shares, the brokerage post-GST will also be greater as against earlier. Further, the cost of holding securities in a demat account would go up as well in the GST regime.

TABLE 12: TRANSPORT SERVICES

CHEAPER	GST rate	Pre-GST rate	COSTLIER	GST rate	Pre-GST rate
Cab and taxi rides	5%	6%	Business/Premium/ First class air tickets	12%	8.4%
			AC travel trains	5%	4.5%

Source: The Economic Times, July 1st, 2018

With respect to travel by air, the cost would depend whether you choose to travel by economy or business class. For the economy class airline fare, the GST rate applicable is 5% as against the previous airline service tax thereto of 5.6%, making the fare marginally inexpensive. But in case you chose to travel business class, the airline fare would be a bit expensive, owing to 12% GST applicable thereto as against 8.4% service tax applicable earlier.

6. Tax rates on other goods and services

1). Footwear & apparels/garments:

Footwear costing more than Rs. 500 will have a GST rate of 18% from an earlier rate of 14.41 rate but rates for the footwear below Rs. 500 has been reduced to 5%. With respect to the ready-made garments, the rates have been reduced to 12% from an existing 18.16% which will make them cheaper.

2). Train fare:

There will not be much of an impact. The effective tax rate has increased from 4.5% to 5% in GST. But, passengers who travel for business trips can claim Input Tax Credit on their rail ticket which can help them to reduce expenses. People travelling by local trains or in the sleeper class will not be affected but first-class & AC travelers will have to pay more.

3). Movie tickets:

Movies tickets costing below Rs. 100 will be charged a GST rate of 18% but prices above Rs. 100 will have a higher tax rate of 28%.

4). Jewellery:

The gold investment will become slightly expensive because there will be 3% GST on gold and 5% on the making charges. The earlier tax rate on gold was around 2% in most of the states and the GST is increased from the existing rate to around 2% to 3%.

5). Buying a property:

The construction properties will be cheaper than ready-to-move-in properties. The GST rate for an under-construction property is 18% but the effective rate on this kind of property will be around 12% due to input tax credits the builder will avail of.

6). Education & medical facilities:

Education and medical sectors have been kept outside the GST ambit and both the primary education and healthcare is exempt from GST. It means a consumer will not pay any tax for the money you spent on these services. But due to increase in the rate of taxes for certain goods and services as procured by these organizations, they may pass on the additional tax burden to the consumers.

7). Hotel stay:

For the hotel stay, if the room tariff is less than Rs 1,000 then there will be no GST but anything above Rs 5,000 will attract 28% tax.

8). Buying a car:

Most of the cars in the Indian market will become slightly cheaper, except for the hybrid cars because the GST rate will be 28% tax on all the vehicles irrespective of their make, engine capacity or model. However, over and above this 28%, an additional cess will be levied which can be 1%, 3% or 15 %, depending on the particular car segment.

9). Mobile bills:

People will have to pay more on mobile phone bills as GST on telecom services is now 18% as opposed to the earlier tax rate of 15%. However, telecom companies may absorb this 3% rise due to fierce competition.

10). Restaurant bills/eating out:

The restaurant bill would depend on whether dined at an AC or Non-AC establishments which do not serve alcohol. Now dining at five-star hotels will be charged at 18% GST rate and the Non-AC restaurants will be charged 12% and a 5% GST will be charged from small hotels, dhabas and restaurants which do not cross an annual turnover of Rs. 50 Lakh.

11). IPL & other related events:

Events like IPL i.e. sporting events will have a 28% GST rate which is higher than the earlier 20% rates. This will increase the price of the tickets. The GST rate for other events like theatre, circus or Indian classical music shows or a folk dance performance or a drama show will be at 18% GST rate, this is lesser than the earlier tax rate.

12).DTH and cable services:

The money you pay towards your DTH (Direct-To-Home) connections or to your cable operator will reduce a bit as the rate is fixed at 18%, which is lower than the earlier taxes which were comprising of entertainment tax in the range of 10% to 30%, apart from the service tax of 15%.

13). Amusements parks:

The ticket price for amusement parks and theme parks will increase as the earlier service tax of 15% will become 28% under the GST.

Items which are completely exempt from the GST:

1. The unprocessed cereals, rice and wheat etc.
2. The unprocessed milk, vegetables (fresh), fish, meat, etc.
3. Unbranded Atta, Besan or Maida.
4. Kid's colouring book/drawing books.
5. Sindoor/Bindis, bangles, etc.

7. Adverse effect of GST on consumers:

There were many exemptions provided for various services earlier. But under GST exemptions have been given only where necessary. Thus, the businessmen will pass the ultimate economic tax burden to the consumers. Also on certain goods like tobacco products, aerated water, motor cars; additional cess is being levied which is known as **"compensation cess"** that making the goods costlier. Moreover, certain services such as accommodation in hotels, work contract, movie tickets, etc. to get costlier as previous

service tax charged was around 15% and the current GST rate charged for them is 18% or 28%.

8. What the future looks like

Talking about the long-term benefits, it is expected that GST would not just mean a lower rate of taxes but also having minimum tax slabs. Countries where the Goods and Service Tax has helped in reforming the economy having only 2 or 3 rates – one being the mean rate, second a lower rate for essential commodities and third one is a higher tax rate for the luxurious commodities. Currently, in India, we have 5 slabs with as many as 3 rates – an integrated rate, a central rate and a state rate. In addition to these, cess is also levied. The fear of losing out on revenue has kept the government from gambling on fewer or lower rates. This is very unlikely to see a shift anytime soon, though the government has said that rates may be revisited once the RNR (revenue neutral rate) is reached.

The impact of GST on macroeconomic indicators is likely to be very positive in the medium-term. Inflation would be reduced as the cascading (tax on tax) effect of taxes would be eliminated. The revenue from the taxes for the government is very likely to increase with an extended tax net and the fiscal deficit is expected to remain under the checks. Moreover, exports would grow, while FDI (Foreign Direct Investment) would also increase. The industry leaders believe that the country would climb several ladders in the ease of doing business with the implementation of the most important tax reform ever in the history of the country.

9. Conclusion

In conclusion, GST is a step forward for India to integrate its market and systematically develop its economy as a whole. The essence of GST is that all goods and services be taxed at moderate rate. So, in the long run it is expected that the burden of GST on common man will be reduced. GST, the biggest tax reform in the country has kicked in. Although the goods and services get cheaper on account of ITC available to most of the goods and services and certain exemptions available thereon, there has been a drastic increase in the rate of taxes on various items. Hence, it will be good if a consumer makes the analysis of the applicable rates and then make purchases or consume the services according to his income pattern.

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Status of Health Insurance Sector in India

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ABSTRACT

The insurance sector in India has evolved to a greater degree over the last couple of decades. There are new trends driving the demand for life insurance with customer aspirations and expectations being raised. While regulatory reforms and advances in technology have profoundly influenced the growth and development of the sector, there is still immense potential as the economy continues on its growth trajectory.

The insurance sector has played a key role in the financial inclusion drive through its products. Since the structure of the economy is undergoing change, the insurers also need to respond to these challenges in a positive manner. The insurance sector will have to be at the forefront for providing sustainable security products to address various risks that affect the people and also play an active role by undertaking activities that promote the penetration and density of insurance.

Health care has always been a problem area for India, a nation with a large population and larger percentage of this population living in urban slums, rural areas and also below the poverty line. Health care has become one of the India's largest sectors - both in terms of revenue and employment. It comprises hospitals, medical devices, clinical trials, outsourcing, telemedicine, medical tourism, health insurance and medical equipment. The Indian healthcare sector is growing at a brisk pace due to its strengthening coverage, services and increasing expenditure by public as well as private players.

Health insurance is now emerging as a tool to manage financial needs of people to seek health services. Today, various health insurance schemes are available in the market and providing benefits from an individual to an entire family. Present paper tries to present the health insurance scenario in India and suggest some initiatives to increase health insurance penetration.

1. Introduction

The term 'Health Insurance' relates to a type of insurance that essentially covers the medical expenses. A health insurance policy like other policies is a contract between an insurer and an individual or a group in which the insurer agrees to provide specified health insurance cover at a particular "premium" subject to terms and conditions specified in the policy.

Health insurance is one of the emerging service sectors in India, which remains highly underdeveloped and less significant segment of the product portfolios is now emerging as a tool to manage financial needs of people to seek health services. Today, various health insurance schemes are available in the market and providing benefits from an individual to an entire family also called family floater policies. The new economic policy and liberalization process followed by Government of India since 1991 paved the way for privatization of insurance sector in the country.

Health insurance is very well established in many countries. But in India it is a new concept except for the organized sector employees. In India only about 2 per cent of total health expenditure is funded by public/social health insurance while 18 per cent is funded by government budget. In many other low and middle income countries contribution of social health insurance is much higher.

According to WHO statistics, hospital admissions about 47% in rural areas and 31% in urban areas respectively were financed by loans and sale of assets. WHO says, 3.2 per cent of Indians will fall below the poverty line because of high medical bills. About 70% of Indians spend their entire income on healthcare and purchasing medicine.

It is really pathetic to know that many Indian people believe that health insurance is not a worthy investment and thus, do not buy these products. These people realize the significance of these products only when their friend or relatives fall sick and face financial hardship. Learning from the experience of other is always good. It is always a good decision to be prepared for such circumstances of life that may bring a great change in an individual's life.

2. Review of Literature

Antony Jacob (2018)[1] stated that, there is a lot more to do in the health insurance sector in India. In many countries it is 95 percent of the population who have private health insurance whereas in India we are still talking of about less

than 100 million people which is less than 10 percent of the people who have private health insurance.

Surya Kannoth (2018)[2] stated that, the future of the Indian health insurance industry looks promising favorable demographics and increasing awareness of the need for preventive health care are significant growth drivers for the sector.

The Boston Consulting Group (BCG), FICCI (2017)[3] reported that, the global insurance industry is being challenged by these megatrends to rethink the ways of working, insurers are forced to adapt in an agile manner, become leaner and more efficient. Big data and digital are common megatrends that are causing disruption and driving transformations across all industries and are finding their way to the core of any insurers' strategy.

Jagendra Kumar (2017)[4] stated that, India's healthcare sector has been growing rapidly driven by a number of factors such as increasing the average life expectancy and average income level and rising awareness for health insurance.

Onicra Credit Rating Agency (2013)[5] reported that, there is an increased demand of health insurance by virtue of an increased healthcare awareness level among people about its need which in turn has increased the demand.

Bhagabat Barik (2014)[6] emphasizes that, people have realized the importance of health insurance due to rise in the healthcare cost. With the advent of latest technology in medical science and demand for good service is the main cause for higher medical cost. Private insurance companies have played a pivotal role in enlarging the vision of the people about healthcare.

3. Research Methodology

The present study is descriptive in nature and will be mainly based on secondary data collected from reputed journals, research reports, books, research articles, information from insurance personnel, IRDA reports and web sites.

4. Objectives

The objectives of the present study are -

1. To present the status of health insurance in India
2. To suggest some regulatory initiatives to increase health insurance penetration

5. Need of the study

According to a survey by NSSO (National Sample Survey Organization) 40% of the people hospitalized have either had to borrow money or sell assets to cover their medical expenses. A significant proportion of population may have had to forego treatment all together. Thus, more than the disease it is the cost of treatment that takes its toll. To get rid of health worries health insurance is the answer.

6. An overview of health insurance sector in India

Health insurance sector in India has witnessed a sea-change recently. The high cost of medical treatment induced the public to think about health insurance plans. As health is important without any medical coverage people use their earnings and assets to cover medical costs. Affordable health insurance plan has made people aware of the benefits they can avail by buying various health insurance plans.

The Government has established Insurance Regulatory and Development Authority (IRDA) which is a statutory body for regulation of the whole insurance industry. They would be granting licenses to private companies and will regulate the insurance business. As the health insurance is in its very early phase, the role of IRDA will be very crucial. They have to ensure that, the sector develops rapidly and the benefit of the insurance goes to the consumers.

7. Registered insurers in India

At the end of March 2017, there are 62 insurers operating in India of which 24 are life insurers, 23 are general insurers, 6 are health insurers exclusively doing health insurance business and 9 are re-insurers including foreign reinsurers' branches and Lloyd's India.

TABLE 1 : REGISTERED INSURERS INCLUDING FOREIGN REINSURERS' BRANCHES / LLOYD'S INDIA

S.No	Type of Insurer	Public sector	Private sector	Total
1	Life	1	23	24
2	General	6	17	23
3	Health	0	6	6
4	Re-insurers (including Foreign Reinsurers Branches/ Lloyd's India)	1	8	9
	Total	8	54	62

Source: IRDA Annual Report 2016-17

Of the 62 insurers presently in operation, eight are in the public sector and the remaining fifty four are in the private sector. Two specialized insurers namely ECGC and AIC, one life insurer namely LIC of India (LIC) four in general insurance and one in reinsurance namely GIC are in public sector. 23 life insurers, 17 general insurers, 6 standalone health insurers and 8 reinsurers including foreign reinsurers' branches and Lloyd's India are in private sector.

8. Classification of health insurance business

Health insurance business can be classified into Government Sponsored Health Insurance, Group Health Insurance (Other than Government Sponsored) and Individual Health Insurance. In terms of contribution of these 3 lines, the share of group business was the highest at 48 percent,

followed by individual business (42 percent) and Government Business (10 percent).

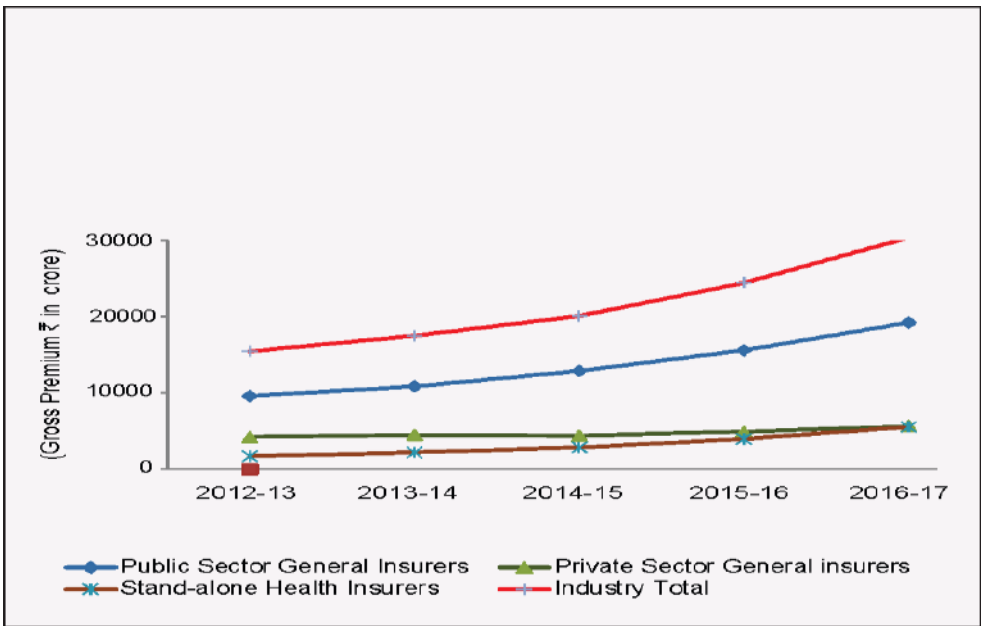
TABLE 2 : TREND IN HEALTH INSURANCE PREMIUM OVER THE PAST FIVE YEARS

(Rs.crore)

S.No	Sector	2012-13	2013-14	2014-15	2015-16	2016-17
1	Public Sector General Insurers	9580 (62%)	10841 (62%)	12882 (64%)	15591 (64%)	19227 (63%)
2	Private Sector General insurers	4205 (27%)	4482 (26%)	4386 (22%)	4911 (20%)	5632 (19%)
3	Stand-alone Health Insurers	1668 (11%)	2172 (12%)	2828 (14%)	3946 (16%)	5532 (18%)
	Industry Total	**15453**	**17495**	**20096**	**24448**	**30392**
	Annual Growth Rate (In %)	**18.2**	**13.2**	**14.9**	**21.7**	**24.3**

Source: IRDA Annual Report 2016-17

FIGURE 1 : TREND IN HEALTH INSURANCE PREMIUM



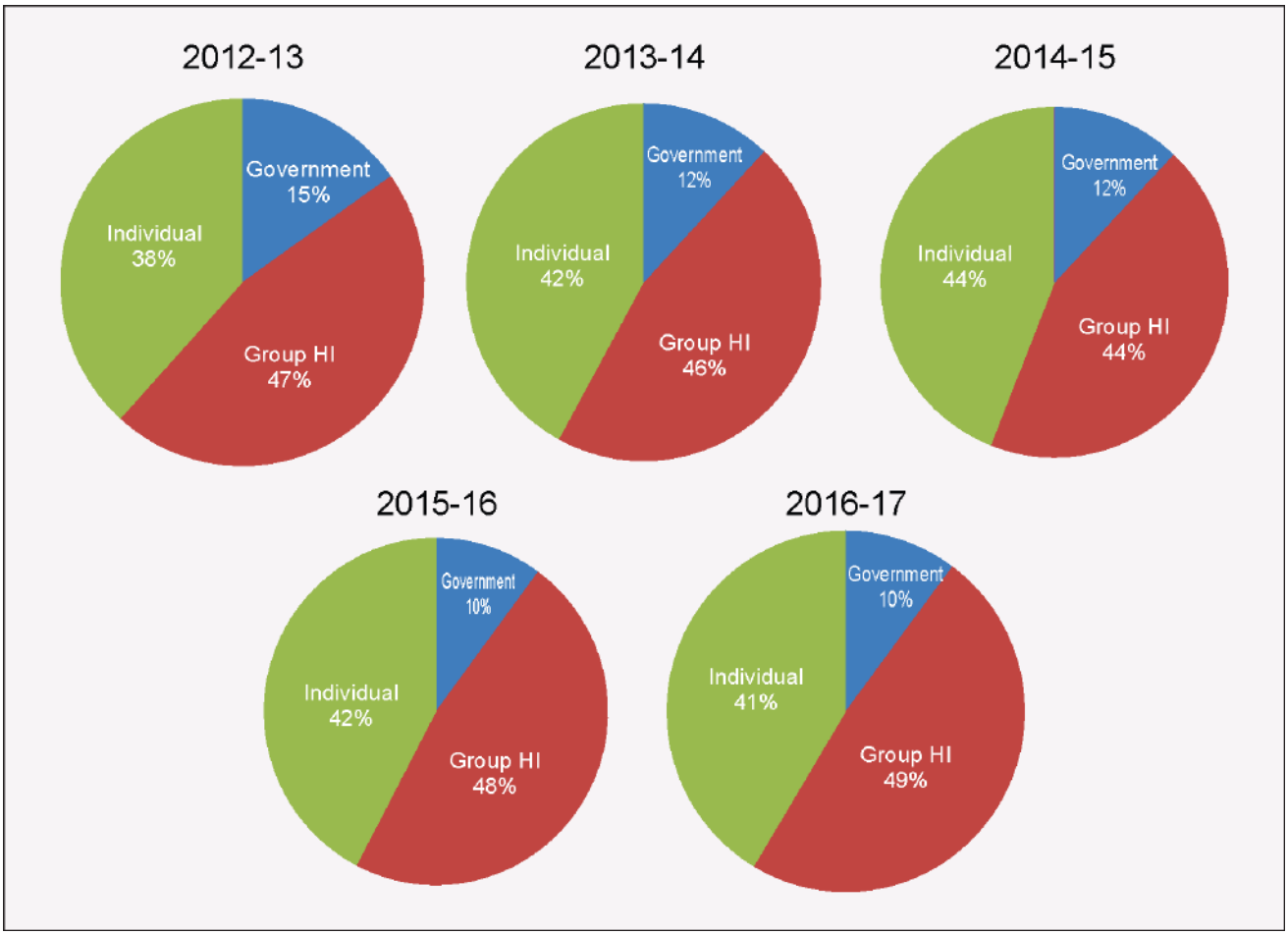
In terms of amount of premium collected, there is no significant increase in premium from the Government sponsored schemes over the past five years. However, the amount of premium collected from both individual and group business (other than government schemes) has more than doubled during the last five year period.

TABLE 3 : CLASSIFICATION OF HEALTH INSURANCE PREMIUM

S.No	Class of Business	2012-13	2013-14	2014-15	2015-16	2016-17
1	Government Sponsored Schemes including RSBY	2348 (15%)	2082 (12%)	2474 (12%)	2425 (10%)	3090 (10%)
2	Group Business (other than Government Business)	7186 (47%)	8058 (46%)	8899 (44%)	11621 (48%)	14718 (48%)
3	Individual Business	5919 (38%)	7355 (42%)	8772 (44%)	10353 (42%)	12584 (42%)
	Grand Total	**15453**	**17495**	**20096**	**24448**	**30392**

Source: IRDA Annual Report 2016-17

FIGURE 2 : CLASSIFICATION OF HEALTH INSURANCE BUSINESS



During 2016-17, General and Health Insurance Companies collected Rs. 30392 crore as health insurance premium and a registering a growth of 24.3 percent over the previous year, which is the highest ever registered in the preceding five years period.

In terms of market share of health insurance premium, the four public sector general insurers continue to hold larger market share at 63% during the financial year 2016-17. The market share of public sector insurers remained stagnant at this level over the past 5 years. On the other hand, the share of private sector general insurers in health insurance premium is declining from 27 percent in the financial year 2012-13 to 19percent during financial year 2016-17 and the share of standalone health insurers in health insurance premium had gone up from 11 percent to 18 percent over the last 5 year period

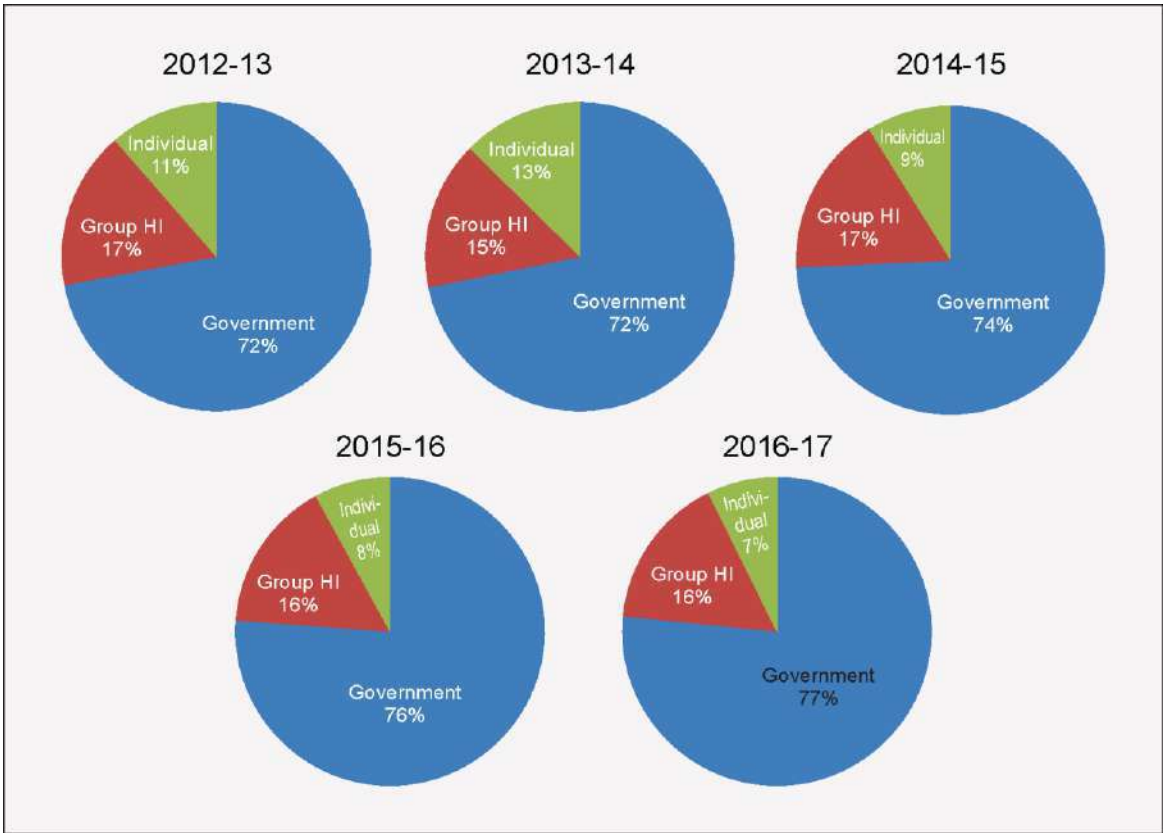
Number of policies issued and number of persons covered under Health Insurance Business. During 2016-17, the general and health insurance companies have issued 1.31 crore health insurance policies (excl. PA & Travel Insurance) covering a total of 43.75 crore persons (2015-16: 35.9 crore) and registered a growth of 21.9 percent in number of persons covered over the previous year.

TABLE 4 : NUMBER OF PERSONS COVERED UNDER HEALTH INSURANCE

S.No	Class of business	2012-13	2013-14	2014-15	2015-16	2016-17
1	Government Sponsored Schemes including RSBY	1494 (72%)	1553 (72%)	2143 (74%)	2733 (76%)	3350 (77%)
2	Group Business (other than Govt. Business)	343 (17%)	337 (15%)	483 (17%)	570 (16%)	705 (16%)
3	Individual Business	**2073**	**2162**	**2880**	**3590**	**4375**

Source: IRDA Annual Report 2016-17

FIGURE 3 : NUMBER OF PERSONS COVERED – SHARE OF DIFFERENT CLASSES OF BUSINESS



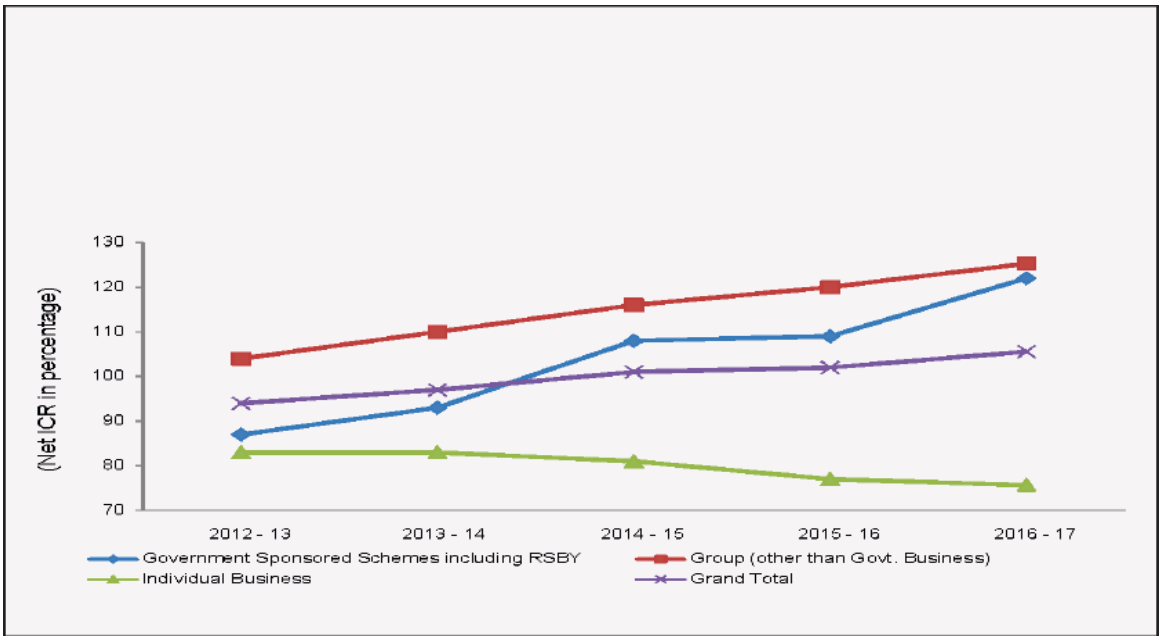
In terms of number of persons covered under health insurance, three-fourth of the persons were covered under government sponsored health insurance schemes and the balance one-fourth were covered by group and individual policies issued by general and health insurers.

TABLE 5 : SECTOR WISE CLASS OF BUSINESS – NET INCURRED CLAIMS RATIO

S.No	Class of Business	2012-13	2013-14	2014-15	2015-16	2016-17
1	Government Sponsored Schemes including RSBY	87%	93%	108%	109%	122%
2	Group Business (other than Govt. Business)	104%	110%	116%	120%	125%
3	Individual Business	83%	83%	81%	77%	76%
	Total Business	**94%**	**97%**	**101%**	**102%**	**106%**

Source: IRDA Annual Report 2016-17

FIGURE 4 : NET INCURRED CLAIMS RATIO OF HEALTH INSURANCE BUSINESS



The trend of increase in Net Incurred Claims Ratio (Net ICR) continued in 2016-17. The Net ICR has consistently gone up from 94% in 2012-13 to 106% in 2016-17. Among the various classes of health insurance business, in particular the Net ICR is high for Group Business (Other than Government Business),which was more than 100 percent for each of the preceding five years and also consistently increasing over the same period.

In respect of Government Sponsored Health Insurance also, the Net ICR increased from 87 percent during 2012-13 to 122 percent in 2016-17.On the other hand, there is an improvement in respect of the Net ICR of individual business, as it is showing gradual decline from 83 percent in 2012-13 to 76 percent in 2016-17.

It may be observed that the Net ICR of public sector general insurers was more than 100 percent for all the preceding five years. On the other hand, during the same period, the Net ICR of private sector general insurers and stand-alone health insurers was gradually improving.

9. Health insurance business carried out in foreign countries

Only 3 public sector general insurers namely New India, National Insurance and Oriental Insurance carry-out health insurance business in foreign countries

TABLE 6 : HEALTH INSURANCE BUSINESS IN FOREIGN COUNTRIES 2016-17

(No of policies in actual) (No. of persons in '000)(Incurred Claims ratio in % age)

(Amount in Rs.lakh**)**

S. No	Line of Business	No. of policies issued	No. of persons covered	Gross premium	Net earned premium	Claims incurred (Net)	Incurred claims Ratio (Net)
1	National	40	19	214	196	271	138
2	New India	15560	2324	15157	14278	11849	83
3	Oriental	452	25	373	363	200	55
	Public Sector Total	**16052**	**2368**	**15743**	**14837**	**12320**	**83**

Source: IRDA Annual Report 2016-17

During the financial year 2016-17 these 3 insurers have procured a total of Rs. 157.43 crore as gross premium from health insurance business (incl.PA and Travel Insurance Businesses) and have covered a total number of 23.68 lakh persons. Amongst these 3 insurers, New India Assurance alone contributed 96% of total health insurance premium from foreign countries covering 98% of total number of persons covered in foreign countries.

10. FDI In Insurance Sector

Earlier, only up to 26 per cent FDI was permitted through the automatic approval route. For FDI up to 49 per cent, the approval of the Foreign Investment Promotion Board was required. There are 52 insurance companies operating in India, of which 24 are life insurance business and 28 in general insurance (Mar 31, 2016)

The government is considering allowing 100 per cent foreign direct investment (FDI) in insurance intermediaries with a view to give a boost to the sector and attracting more funds, sources said. Intermediary services include insurance broking, third party administrators, surveyors and loss assessors (May 9, 2018)

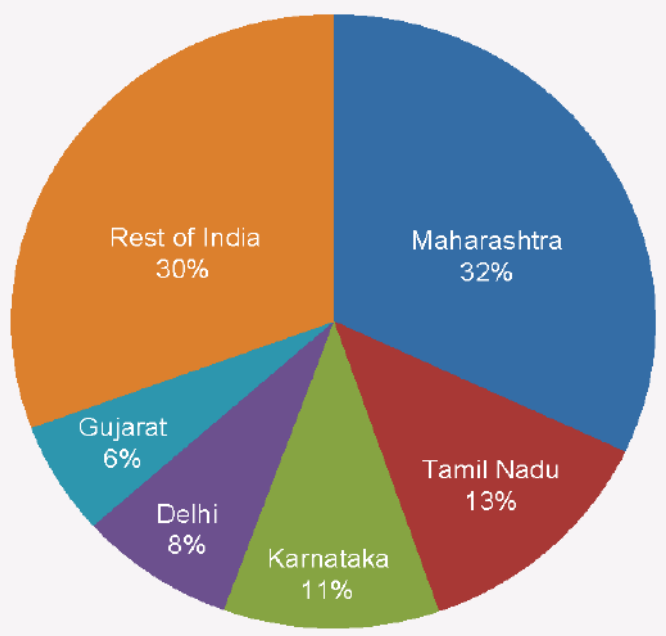
11. State-Wise Distribution Of Health Insurance Business

TABLE 7 : SHARE OF TOP 5 STATES IN HEALTH INSURANCE PREMIUM 2016-17

S.No	State	Total Health Insurance Business (Rs. In lakhs)	Percentage of share in All-India premium
1	Maharashtra	972378	32
2	Tamil Nadu	386165	13
3	Karnataka	329903	11
4	Delhi	238661	8
5	Gujarat	181372	6
6	Rest of India	930692	30
	All India Total	**3039171**	**100**

Source: IRDA Annual Report 2016-17

FIGURE 5 : SHARE OF STATES IN HEALTH INSURANCE PREMIUM 2016-17



State-wise distribution of health insurance business has indicated a skewed distribution of health insurance business across various States and Union Territories of India. While five states namely Maharashtra, Tamil Nadu, Karnataka, Delhi UT and Gujarat contributed 69 percent of the total health insurance premium, the rest 31 States/Uts have contributed 30 percent of the total Health insurance premium. The state of Maharashtra alone contributed Rs. 972378 lakh (32 percent) of total health insurance premium.

LIST OF HEALTH INSURANCE COMPANIES IN INDIA WITH MARKET SHARE

S.No	Name of the Insurance company	Market share (%)
1	Royal Sundaram	2.55
2	TATA-AIG	2.82
3	Reliance	2.95
4	IFFCO Tokio	3.4
5	ICICI Lombard	8.86
6	Bajaj Allianz	5.65
7	HDFC ERGO	3.16
8	Cholamandalam	2.32
9	Future Generali	1.59
10	Universal Sompo	0.7
11	Shriram	2.18
12	Bharti Axa	1.52
13	Raheja QBE	0.03
14	SBI	0.43
15	L&T	0.25
16	Magma HDI	NA
17	Liberty Videocon	NA
18	Star Health & Allied Insurance	1.87
19	Apollo MUNICH	0.82
20	Max BUPA	0.17
21	Religare Health	NA
	Private Insurance companies total	41.25%
22	New India	14.70%
23	National	13.4
24	United India	14.07
25	Oriental	10.41
26	ECGC	1.73
27	AIC of India	4.43
Public insurance companies total		58.75
Grand Total		100%

Out of total 27 health insurance companies in India, 21 in private sector and 6 in public sector. The private sector total market share in health insurance is 41.25 per cent whereas, 58.75 per cent in public sector. ICICI having the highest market share with 8.86 percent followed Baja Allianz with 5.65 per cent in private sector. In public sector New India having the highest market share with 14.70 percent followed United India.

12. Regulatory initiatives to increase health insurance penetration

Based on the experience gained and examining the recommendations of Expert Committee (IRDA) on health insurance and feedback received from stakeholders, the need was felt to revisit the health insurance regulatory framework, inter alia, for the following reasons-

- To enhance the scope for product innovations:
- To make provisions to reward healthy behavior of policyholders
- To ease the process of product approval
- To facilitate the provision of wellness and preventive features as part of Health Insurance
- Policies

1). To launch pilot products:
General insurers or health insurers are permitted to launch pilot products for a period not exceeding five years with a view to giving scope to innovation for covering risks that have not been offered hitherto or stand excluded in the extant products. At the end of the five-year period from the date of launch, the pilot product shall be either continued as a regular product or shall be withdrawn. Enhanced disclosure norms are prescribed so that the policyholders have an informed choice before taking a decision whether or not to buy a pilot health insurance product.

2). Wellness and preventive features:
Norms were prescribed for encouraging the insurers to introduce Wellness and Preventive Features as part of a health insurance policy.

3). Facilitation to offer Group Products under use and file procedure:
To allow the insurers to offer Group Health Insurance Products with ease, the Authority has now put in place Use and File Procedure for offering Group Insurance Products by General and Health Insurers under which prior approval of the authority is dispensed with.

4). Norms to protect the interests of policyholders:
In order to protect the interests of policyholders the specific provisions were incorporated in Health Insurance Regulations 2016 that, the insurers may offer Cumulative Bonus (enhancement of Sum Insured without corresponding increase in premium, if there is no claim) for benefit based policies also.

5) Enhancing the scope of health insurance:
To further enhance the scope of Health Insurance some initiatives must be taken.

6) Claim administration and mitigation of frauds:
Insurers and TPAs should put in place fraud mitigation systems to identify and curb misuse of health insurance, in addition to complying with the extant regulatory framework put in place by the Authority for prevention of frauds. A proper fraud mitigation system not only helps in protecting the interests of genuine policyholders but also prevents financial loss arising due to frauds, whether internal or external.

13. Conclusion

To conclude, there is no doubt that, the health insurance in India is going to develop rapidly in future. The task of the Government, private providers and the civil society is to solve the issues and challenges and to see that the health insurance benefits and health services are available at lower costs to the people of the country with quality.

The experience suggests that, if the health insurance is left only to the private market it will only cover those which have substantial ability to pay leaving out the poor and making them more vulnerable. Hence, the existing central and state health insurance schemes also need substantial reforms to make them more efficient and socially useful. Since most of the people are working in unorganized sector, there is a need to adopt the social health insurance to those people and also to create the awareness on rights, responsibilities, standardization of cost and tax benefits on health insurance.

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VALIDATED SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF DOXAZOCIN IN PURE AND IN ITS DOSAGE FORM

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ABSTRACT

A simple, precise, rapid, sensitive and accurate Spectrophotometric methods have been developed for the estimation of Doxazocin UV in pure form and its pharmaceutical formulations based on oxidative complexation reaction UV with 1.10- phenanthroline reagent at P^H- 4 which is extractable at 510nm. Beer's law is obeyed in the concentration range 1-6ml (10 to 60µg ml^{-1}). The developed method was applied directly and easily for the analysis of the pharmaceutical formulations. RSD was found to be 0.5318 and recovery 99.77 % respectively. The method was completely validated and proven to be rugged. The interferences of the ingredients and excipients were not observed. The repeatability and the performance of the proved method were established by point and internal hypothesis and through recovery studies.

KEYWORDS

Spectrophotometry, Doxazocin, 1, 10-phenanthroline and Oxidative complexation.

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INTRODUCTON

Doxazosin [(4-amino-6, 7-dimethoxy-2-quinazolinyl)-4-(1, 4-benzodioxan-2-yl-carbonyl) piperazine] is a postsynaptic α 1-adrenoreceptor antagonist used either alone or in combination with diuretics or α1-adrenergic-receptorant agonist for the treatment of hypertension and benign prostatic hyperplasia. It is structurally related to prazosin Figure No.1. The literature survey of Doxazosin as follows. Babmoto *et al*[1], Eliot *et al*[2], and Carlson *et al* and Bailey *et al*[3], has to Report the analysis of pharmacokinetics and effect on blood pressure of Doxazosin in normal subjects and patients.

Cowlishaw *et al*[4], has to describe HPLC with Fluorescence detection for Doxazosin determination. HPNC analysis of Doxazosin has been reported in human serum and roboticsamples[5-10]. X. Wat, *et al*, have been reported for the analysis of Doxazosin by Solid-Phase extraction[11]. Ma *et al*[12], has been described Mass spectrophotometry for analysis of Doxazosin. Validation of Doxazosin by HPLC in human serum and food determined by UV-Vis spectrophotometric method[13-19], Volummetric methods[20-29].

In the present study an attempt has been made to develop simple UV-Vis spectrophotometric method for quantitative estimation of Doxazosin in its technical grade formulations and biological sample (blood). The functional group used for the color development of Doxazosin was primary amine. The result obtained in this method was based on complexation reaction formation reaction of Doxazosin with 1, 10-phenanthroline. The empirical formula for Doxazosinmesylate is $C_{23}H_{25}N_5O_5$ and the molecular weight is 451.47 grams. It has the following structure.

There is however no reported UV- Vis spectrophotometric method for the analysis of Doxazosinin its technical grade and formulations. In the present study an attempt has been made to develop simple UV-Vis spectrophotometric method for the quantitative determination of Doxazosin. Functional group used for color development of Doxazosin was primary amine group. The results obtain in this method was based on oxidative complexation reaction with 1, 10-PT. An attempt has been made to develop and validate all methods to ensure their accuracy, precision, repeatability, reproducibility and other analytical method validation parameters as mentioned in the various guidelines.

MATERIAL AND METHODS

Pure sample

The pure sample was collected from CIPLA pharmaceuticals. Avalahalli, Vigro agar, Bangalore, 560049.

Preparation of standard calibration curve of pure drug

Solvent

Dimethylsulfoxide was used as solvent.

Preparation of standard stock solution

Accurately weighed 100 mg of Doxazosin was dissolved in 40 ml of Dimethylsulfoxide in 100ml volumetric flask and volume was made up to the mark with Dimethylsulphaoxide. i.e. 1000µg ml^{-1} (Stock solution A). Twenty tablets containing Doxazosinmesylate were weighed and From the above stock solution A 10ml was pipette out into 100ml volumetric flask and the volume was made up to the mark with Dimethylsulfoxide to obtain the final concentration of 100µg ml^{-1} (Stock solution B)

Preparation of Calibration curve

Fresh aliquots of ranging from 1 to 6ml were transferred into a series of 10ml volumetric flasks to provide final concentration range of 10 to 60 (µg ml^{-1}). To each flask 1ml of (0.01M) 1, 10-phenanthroline solution was added followed by 1ml of (0.2%) Ferric chloride solution and resulting solution was heated for 15 min and finally 1ml (0.2M) Ortho phosphoric acid solution was added. The solutions were cooled at room temperature and made up to mark with distilled water. The absorbance of orange red colored chromogen was measured at 510 nm against the reagent blank. The color species was stable for 24 h. The amount of Doxazosin present in the sample solution was computed from its calibration curve.

Procedure for formulations

An accurately weighed portion of the powder equivalent to 100mg of Doxazosin was dissolved in 100 ml of Dimethyl sulfoxide and mixed for about 5min and then filtered. The Dimethyl sulfoxide was evaporated to dryness. The remaining portion of solution was diluted in 100 ml volumetric flask and made up to 100 ml to get the stock solution A. 10ml of aliquots was pipette out into 100ml volumetric flask and the volume was made up to the mark with Dimethylsulfoxide to obtain the final concentration of 100µg ml^{-1}(Stock solution B).

Subsequent dilutions of this solution were made with Dimethylsulfoxide to get concentration of 10 to 60µg ml^{-1} and were prepared as above and

analyzed at the selected wavelength, 510nm and the results were statistically validated.

Procedure for Blood sample

After collection of blood sample it will be centrifuged. For isolation of Doxazosin from plasma sample, Dimethylsulfoxide was used for protein precipitation. Liquid- Liquid extraction was performed with plasma by alkalinization with 1M NaOH, followed by extraction with 30% dichloromethane in Hexane. The upper organic layer was evaporated to dryness and the dry residue 100mg was dissolved in 100 ml of Dimethylsulfoxide (1000µgml^{-1}). From the above solution 10ml is taken into a 100ml volumetric flask and made up to the mark (100µg ml^{-1}).

From the above solution ranging from 1- 6ml (10-60µg ml^{-1}) were transferred in to 10ml volumetric flask and to the each flask 1ml of (0.01M) 1, 10-phenanthroline solution was added followed by 1ml of (0.2%). Ferric chloride solution and made up to the mark. Then the resulting solution was heated for 15 min and finally 1ml (0.2M) Orthophosphoric acid solution was added. The solutions were cooled at room temperature and made up to the mark with distilled water. The absorbance of orange red colored chromogen was measured at 510nm against reagent blank. The color species was stable for 24 h. The amount of Doxazosin present in the sample solution was computed from calibration curve.

RESULTS AND DISCUSSION

Optical parameters

In order to ascertain the optimum wavelength of maximum absorption (λ_{max}) formed in UV spectrophotometric method (Reference method – A) and the colored species formed in each four visible spetrophotometric methods, specified amount of Doxazosin in final solution 10µg ml^{-1}is taken and the colors were developed. The absorption spectra were recovered on spectrophotometer in the wavelength region of 380-800 nm against corresponding reagent blanks. The regent blank absorption spectrum of each method was also recorded against distilled water (or) Dimethylsulfoxide. The results are graphically represented.

Parameters fixation

In developing these methods, a systematic study of the effects of various relevant parameters in the methods concerned were under taken by verifying one parameter at a time and controlling all other parameters to get the maximum color development for this method. Reproducibility and reasonable period of stability of final colored species formed. The following studies were conducted.

METHODS

The results obtained in this method were based on oxidation followed by complex formation reaction of Doxazosin with 1,10-phenanthroline, Ferric chloride and Orthophosphoric acid to form an orange red colored chromogen that exhibited maximum absorption at 510 nm against the corresponding reagent blank. The functional group used for the color development for this method was primary amine group. A schematic reaction mechanism of Doxazosin with 1, 10-Phenanthroline reagent was shown in Figure No.4. The effect of various parameters such as concentration and volume of 1, 10- Phenanthroline and strength of acid order of addition of reagents, solvent for final dilution were studied by means of control experiments varying one parameters at a time.

Optical characteristics

The reference method adhere to Beer's law the absorbance at appropriate wave length of a set of solutions contains different amounts of Doxazocin and specified amount of reagents (as described in the recommended procedure) were noted against appropriate reagent blank. Least square regression analysis was carried out for the slope. Intercept and correlation coefficient, Beer's law limits, molar absorptivity and sandells sensitivity for Doxazocin with each of mentioned reagents was calculated. In order to test whether the colored species formed in the method adhere the Beer's law the absorbance at appropriate wavelength of a set of solutions contain different amounts of Doxazocin and specified amount of reagents (as described in the recommended procedure) were noted against appropriate reagent blanks or distilled water. The Beer's law plots of the system illustrated

graphically in Figure No.3 and No.4 least square regression analysis was carried out for the slope, intercept and correlation coefficient, Beer's law limits molar absorptivity Sandells sensitivity for Doxazocin with each of mentioned reagents were calculated. The optical characteristics are represented in the Table No.1.

PRECISION

The precision of each one among the five proposed spectrophotometric methods were ascertained separately from the absorbance values obtained by actual determination of a fixed amount of Doxazosin (5, 4, 10 and 5µg ml^{-1} respectively - A, B, C and D) in final solution. The percent relative standard deviation and percent range of error (at 0.05 and 0.01 confidence limits) were calculated for the proposed methods and presented in Table No.1.

Analysis of formulations

Commercial formulations of Doxazosin were successfully analyzed by the proposed methods. The values obtained from the proposed and reference methods were compared statistically by the t and F tests and were found that those proposed methods do not differ significantly from the reported methods and they were presented in Table No.2. The proposed methods also applied for Biological Samples (blood) for recoveries are obtained were recorded in Table No.7.

Accuracy

Recovery studies were carried by applying the method to Drugs sample present in formulations of Doxazosin. (Standard addition method) Similarly the recovery studies were carried by applying the method to Biological sample (blood) to which known amount of Doxazosin correspond to 2 mg formulations taken by the patient. By the following of Standard addition method 2mg of label claim was added. After the addition of these standards the contents were transferred to 100ml volumetric flash and dissolved in solvent. Finally the volume was made up to the mark with solvent. The solution was filtered through Whitman No.41 filter paper. The mixed sample solutions were analyzed and their absorbance value was determined. At each level of recovery five determinations were performed and present in Table No.3. The results obtained were compared with expected results and were statistically validated in Table No.4.

Linearity and Range

The linearity of analytical method is its ability to elicit test results that are directly proportional to the concentration of analyze in the sample within a given range. The range of analytical method is the interval between the upper and lower levels of analyze that have been demonstrated within a suitable level of precision, accuracy and linearity.

Specificity and Selectivity

Specificity is a procedure to detect quantitatively the analyse in the presence of components that may be expected to the present in the sample matrix. While selectivity is a procedure to detect the analyse qualitatively in presence of components that may be expected to present in the sample matrix. The excipient in formulations was spiked in a pre weighed quantity of drugs and then absorbance was measured and calculations were done to determine the quantity of the drugs.

Repeatability

Standard solutions of Doxazosin were prepared and absorbance was measured against the solvent as the blank. The Absorbance of the same concentration solution was measure five times and standard deviation was calculated and presented in Table No.5 and No.9.

Interferences Studies

The effect of wide range of inactive, ingredients usually present in the formulations for the assay of Doxazosin under optimum conditions was investigated. None of them interfered in the proposed methods even when they are present in excess fold than anticipated in formulations.

Solution Stability

The stability of the solutions under study was established by keeping the solution at room temperature for 48 hours. The results indicate no significant change in assay values indicating stability of d rug in the solvent used during analysis. The results are recorded in Table No.6.

Table No.1: Optical characteristics and precision by (1, 10 –PT)

S.No	Parameter	Visible method
1	Color	Orange red
2	Absorption maxima(nm)	510
3	Beer's law limits (µg ml^{-1})	10 to 60
4	Molar absorptivity (l $mol^{-1}cm^{-1}$)	1.0995×10^4
5	Sandell's Sensitivity (µg cm^{-2})	0.04106
6	Regression equation (Y*)	------
7	Slope (b)	0.02194
8	Intercept(a)	0.00662
9	Standard deviation(SD)	0.00405
10	Correlation coefficient (r^2)	0.9997
11	%RSD (Relative standard deviation)*	0.5318
12	Range of errors	------
13	Confidence limits with 0.05 level	0.00324
14	Confidence limits with 0.01 level	0.00425
15	Limits of detection (LOD)(µg ml^{-1})	0.60916
16	Limits of quantification (LOQ) (µg ml^{-1})	1.845

*RSD of six independent determinations.

Table No.2: Assay results of Doxazosin in formulations by UV-Vis method

S.No	Name of the Formulation	Formulation (mg)	Amount found by the proposed method (mg)	Amount found by the reference method[28] (mg)	% Recovery
1	Doxacard	250	249.43 t=0.498* F=0.9998*	244.5	99.77
2	Duracard	250	248.3 t=0.4986* F=0.996*	246.0	99.32

*t and F- values refer to comparison of the proposed method with reference method.

*Theoretical values at 95% confidence limits t= 0.0029 and F= 5.4495

Table No.3: Determination of accuracy of Doxazosin

S.No	Amount of Dox in Formulation (mg)	Amount of Standard Dox added (mg)	Total amount found (mg)	% Recovery
1	248.65	200	447.57	99.46
	247.35	200	445.23	98.94
	247.12	200	444.81	98.85
2	248.32	250	496.64	99.32
	248.3	250	496.6	99.32
	247.9	250	495.8	99.16
3	248.31	300	546.28	99.32
	247.99	300	545.57	99.2
	247.6	300	544.72	99.04

Table No.4: Statistical data for accuracy determination

S.No	Total amount found (mean)	Standard deviation	%RSD
1	445.87	0.825	0.185
2	496.34	0.236	0.0475
3	545.52	0.3555	0.0651

The results are the mean of five readings at each level of recovery.

Table No.5: Repeatability data for Doxazosin at 510 nm

S.No	Conc. ($\mu g\ ml^{-1}$)	Abs 1	Abs2	Abs3	Mean	Std. deviation	(%) RSD*
1	10	0.221	0.22	0.219	0.22	0.001	0.454
2	20	0.433	0.432	0.433	0.432	0.0057	1.319
3	30	0.635	0.634	0.636	0.635	0.001	0.157
4	40	0.878	0.877	0.876	0.877	0.001	0.114
5	50	1.0842	1.083	1.084	1.0837	0.00064	0.055
6	60	1.318	1.317	1.32	1.318	0.00152	0.115

* RSD of six independent determinations.

Table No.6: Stability of the color for 1, 10- phenanthroline method

S.No	Conc. In µg/ml	Time in hours							
1	10	4	8	12	16	20	24	28	32
		0.223	0.223	0.224	0.225	0.225	0.226	0.191	0.115

Table No.7: Assay results of Doxazosin in blood sample

S.No	Name of the formulation	Formulation in (mg)	Amount found by the proposed method in (mg)	Amount found by the reference method[28](A) (mg)	% of Recovery
1	Doxacard	2mg	1.242 t=0.00844* F=0.002979*	1.13	90.08
2	Duracard	2mg	1.225 t=0.00865* F=0.003211*	1.19	97.05

*t and F values refer to comparison of the proposed method with reference method.
*Theoretical values at 95% confidence limits t = 0.00796 and F = 0.0019.

Table No.8: Determination of accuracy of Doxazosin

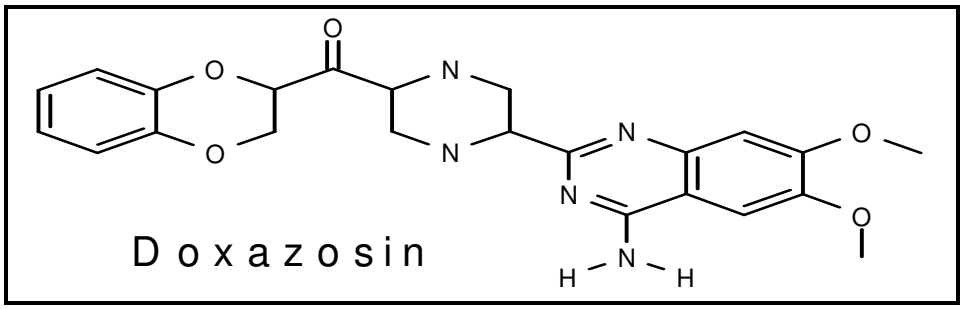
S.No	Name of the formulation in (mg)	Amount of drug in blood sample (mg)	Amount of standard drug added in (mg)	Total amount found (mg)	% Recovery
1	Doxacard (2mg)	1.24	2	3.26	81.5%
2	Duracard (2mg)	1.25	2	3.255	81.37%

The results are the mean of five readings at each level of recovery

Table No.9: Repeatability data for Doxazosin at 510 nm

S.No	Concentration in (µg ml^{-1})	Abs1	Abs2	Abs3	Mean	Std. Deviation	(%) RSD*
1	10	0.0132	0.0133	0.0134	0.0133	0.0001	0.7518
2	20	0.0265	0.0265	0.0267	0.0265	0.0001	0.3773
3	30	0.0398	0.0397	0.0396	0.0397	0.0001	0.2518
4	40	0.0531	0.0531	0.0545	0.0535	0.0008	0.1495
5	50	0.0664	0.0665	0.0667	0.0665	0.000152	0.2255
6	60	0.0797	0.0798	0.0797	0..0797	0.00014	0.1756

* RSD of six independent determinations.



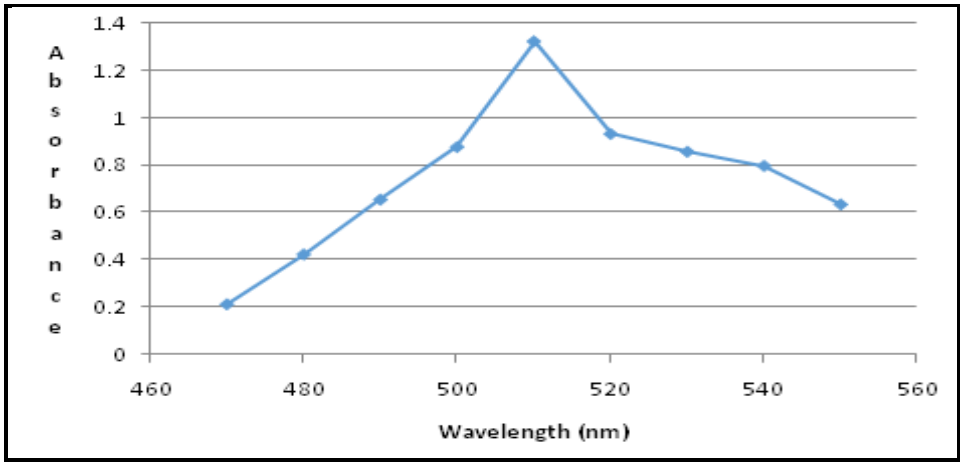


Figure No.1: Absorption spectrum of Doxazosin with 1, 10-Phenanthroline/$FeCl_3$

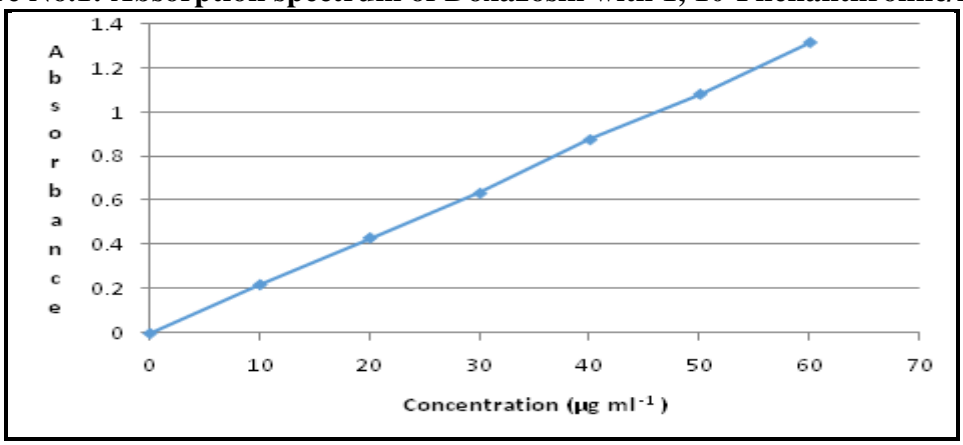


Figure No.2: Beer's law plot of Doxazosin with 1, 10-Phenanthroline/$FeCl_3$

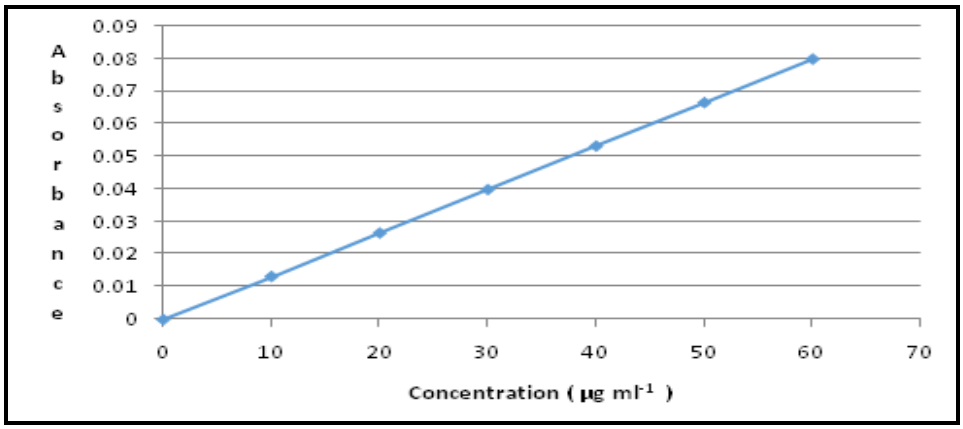


Figure No.3: Beer's law plot for Doxazosin in blood sample

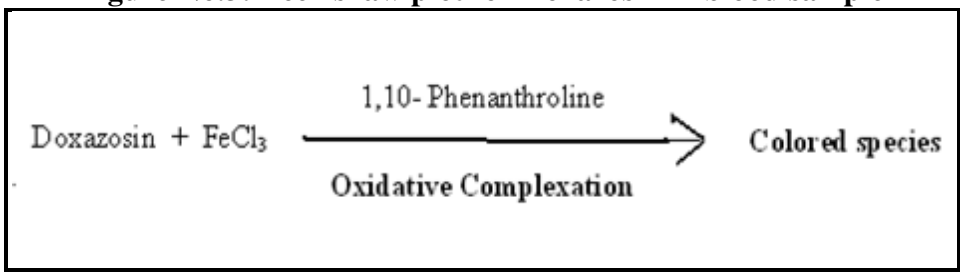


Figure No.4: Chemical reaction of Doxazosin with 1,10 - Phenanthroline

CONCLUSION

The method was found to be accurate and precise, as indicated by recovery studies close to 100 and % RSD is not more than 2. The summery of validation parameters of proposed UV- Vis method is given. The simple, accurate and precise UV- V is method for the determination of Chloramphenicol as bulk, commercial samples and blood samples has been developed. The method may be recommended for routine and quality control analysis of the investigated pure in bulk and samples. The analytical solution is found to be stable up to 48 hrs at room temperature. Hence, it is concluded that the analytical method is validated and can be used for routine analysis and for stability study.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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