



Manthan

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September, 2008

First Bihar Science Conference

Supplement



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Manthan is a quarterly magazine published by BiharBrains, an international Forum of educated people of Bihar with the objectives of sharing ideas, knowledge and achievements which can be benefited to the scientific and non-scientific community.

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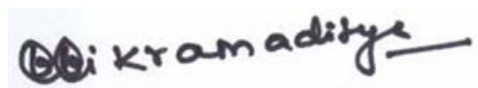
Editor's Desk

Bihar, the eastern state of India was known for the paradise for Intellectuals and center for learning cultural ethics and religious values in ancient times but later it became back-runner in the race of all round development. To rejuvenate this past glory, **BiharBrains Scholastic Center**, (under BBrains Development Society) initiated movement for developing the scientific culture and research environment in the state by organizing Science Conferences, Science & technology festivals, starting R& D Centers, series of seminars and orientation programs on cutting edge technology in Bihar. In the series, the first Bihar Science Conference was organized by this center in association with Patna University and other stake holders. The goal of this first conference was to create a momentum towards building a "Scientific Innovation and Enterprise Center" in Patna to stimulate the research and innovation environment in the State

On this occasion, around 500 delegates of India and abroad were participated and eminent scientists of from various universities namely University of Leeds, UK, Colorado state university, USA, University of oxford, UK, IITs, NITs, Central universities and state run universities and colleges of India took part in the serious scientific discussion.

This issue has covered articles from young scientist awardee and keynote speakers of the said conference. The regular section of Manthan will be continued from the next issue.

We solicit your reactions, comments and suggestions in the mailbox and expect that with your help and support in future this magazine will grow into a versatile platform.
For details you are free to visit our website www.bbmanthan.info.



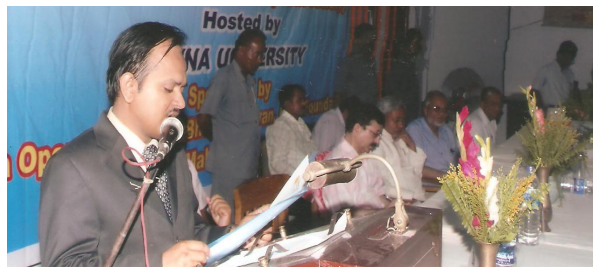
Bibhuti Bikramditya.
Chairman, BiharBrains (BBrains Development Society)
And Patron, Bihar Science Conference, 2008

First Bihar Science Conference, 2008: A Report

*Prof. J. Thakur,
Dr. Dolly Sinha and Dr. Santosh Kumar,
Patna, India*

A three days national conference namely Bihar Science Conference was held from May 07 – 09, 2008, under the aegis of Bihar Brains Development society in which about 500 people participated from different parts of India and Abroad. Bihar Brains Development Society, popularly known as Bihar Brains is a non profit organization registered under society act with special focus on awareness building on education and creating environment for research and development in Bihar. The society came in existence in 2004. It is being run by NRI's, NRB's and educated people of Bihar.

The objective the conference was to bring together the experts from various fields to discuss and evolve suitable measures for high resolution outcome and to explain the collective efforts to achieve the favourable working environment for research and development in the state. The main theme of the conference was scientific innovation and entrepreneurship creations.



Mr. Bibhuti Bikramaditya while introducing theme of the first Bihar Science Conference “Scientific Innovation and Enterprise creation” said that through this Bihar Science Conference, a collaborative conduit of local research in Bihar will be created with the national/international research institute to bring synergy for sharing interdisciplinary knowledge, fostering young creative researchers who work across different faculties, and entrepreneur education based on the integration of humanities and science.



(Swagat Gaan by Patna Science College Team)

The conference was inaugurated by Hon'ble C. M., Bihar, Shri. Nitish Kumar at 11 A. M. sharp on May 7, 2008. The Chairman of B. Brains development Society, Mr. Bibhuti Bikramaditya introduced the theme of the conference and ideas behind it.



(Mr. Bibhuti Bikramaditya, Prof. S.E. Hasnain, Sri Nitish Kumar and Prof. I. Ahson inaugurating the conference)

Prof S. N. Guha, Principal of Patna Science College Welcomed the guest and participants of the conference.



(Participants of the conference in the inaugural function)

Prof. (Dr.) S. E. Hasnain, member of Scientific Advisory council of PM (SAC-PM) V. C. Hyderabad University gave keynote presentation on “Facets of Biotechnology and its effect on society”. In his around 40 minute’s speech, he exemplifies the use of DNA finger printing technology, research advances in Bioterrorism, Polio-virus, genetically modified food, gene technology revolution which has by and large affected society and its behavior.



Hon’ble CM Nitish kumar while inaugurating the conference said that “The scientific research should break the new ground particularly to enrich the quality of human life. “ He thanked organizers to organize such scientific events in state and hoped that this science congress will go a long way in creating scientific temperament among the youth, vital for nation's development“.

Building better atmosphere and for the development of infrastructure, it would be always better to have science congress every year for which the state government would assent to, Kumar said.

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Prof J. Thakur, on behalf of the organizing committee gave vote of thanks to all participants for attending the conference and appreciated member of his organizing committee, and staff of BBrains Development Society who worked day and night for successful completion of this event.

Technical session: Day 1

Ten technical sessions (apart from inaugural session) were held during these three days conference in which four noted scientists from abroad graced the participants by delivering their keynote addresses in four different sessions.

Prof Animesh Jha, chair of Institute of Material Science Research at University of Leeds, UK gave his keynote speech on “Photonics: Harnessing light for sustainable society, environment and wealth creation.



Prof M. K. Mishra, Head of the department of Chemistry, Indian Institute of Technology, Mumbai delivered his keynote on “Photodynamic control: A new perspectives.

Mr. Ashish Kumar of department of Bioinformatics, university of oxford, UK presented his keynote on “Applications of Bioinformatics in whole genome association studies”.



Technical Session: Day 2

Pre-lunch session was started with keynote presentation of Prof B.P.Singh, Advisor, Dept of Science and technology, Govt of India. He spoke on “Research in Animal Sciences: Role of Department of Science and technology”.



Dr. Jitendra Kumar, Dept. of Molecular and Cellular Biology, Ohio State University, Ohio, USA, delivered his lecture on Mitochondrial calcium independent phospholipase.



Dr. Ajay Kumar Jha, programme director international development, college of agricultural sciences, Colarado state university, USA made his keynote presentation on

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agricultural innovation and future of agricultural sustainability under global resource limitations.



Prof Jainendra Kumar presented his keynote on “Human Disease and their genetic basis.



Dr. B. K. Sharma, Head of the department of Electronics, National Institute of Technology, Patna gave his keynote presentation on *Science & Technology in India- Before and After Independence.*





Dr. R. K. Sinha, professor at Dept of the Zoology, Patna University gave his keynote lecture on “Challenges and hopes for the gangetic Dolphines: the flagship species of the gangetic systems.



(Dr. Rakesh Kumar, one of the participants of the conference presenting his lecture)

Poster Presentations:



Technical Session: Day 3

The third and the last day of the conference was started with the keynote presentation by Prof Rajmani Prasad Sinha, Prof of Physics, Patna University, Patna and former Vice chancellor of Mithila University on “Laser cooling”.

Dr. Himanshu Shekhar, Dy Director of HEMRL, DRDO, Pune gave his lucrative keynote speech on “Mechanical Characterization of solid rocket propellants”

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Prof Raman Kumar Jha, head of the department of Physics, Sikkim Manipal University presented keynote speech on “quantum mechanics and computing: the future technology.



A complete academic environment and exchange of ideas prevailed in the Dept. of Physics and Geology premises of P.U.

Panel Discussion and meeting of the scientific council: Panel discussion was held. The executive member of the discussion were Mr. Bibhuti Bikramaditya, Chairman, BBrains Development Society, Prof Animesh Jha, Univ of leeds, UK, Dr. Dolly Sinha, Prof Jainendra Kumar, Dr. Jitendra Kumar, USA and Prof Raman Jha of Sikkim Manipal University, Sikkim.etc. (Detailed report has been given in Recommendations of the Panel discussion).



Certificates were distributed among the participants. Young scientist award for oral and poster presentation was the attraction of the valedictory function. Each young scientist awardees were handed over a cheque of Rs. 1000/- and a felicitation certificate too. Five young scientist awards were given for oral presentation (one from each subject) and four young scientist awards was given for poster presentation.



(Young Scientist awardees after the function)

Valedictory Session:

The valedictory function was held on 09-05-08 between 3 p.m. and 5 p.m. in which Hon'ble Minister of state. (Independent charge) Dept. of information technology, Dr. Anil Kumar graced the occasion with his valuable presence and his assurance on behalf of his Govt. for any type of support in such academic endeavors. He thanked all foreign and Indian participants for attending this conference.



(Prof I. Ahson presenting Young scientist award to Dr. Subodh Kumar of BIT, Mesra)



Prof Rajmani Prasad Sinha stressed the need to work on empowering women for the best use of the technology and requested the society to establish University of Science and technology for women.

Prof J. Thakur thanked all participants for their patients during conference and said that management committed of conference will give attention on the suggestions given by participants and the guests in the next conference.

Mr. Bibhuti Bikramaditya announced the name of the first “Global Scientific Council” and winner of the poster presentation and oral presentation. He also announced that Second Bihar Science Conference will be hosted by Magadh University for which process will be started very soon.

Dr. Dolly sinha gave vote of thanks and thanked media persons, Participants, and sponsors (Bihar Foundation UK, Nalanda Open University, Bharti Bhawan, Magadh Mahila college, NRI members of the society) for their contribution in organizing conference.

Some additional Pics of the conference:



(Action committee team members, volunteers and MBA students of Patna University with BB society members and Guests)



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(Some participants with Dr. Jitendra Kumar, USA and Prof Dolly Sinha)



(Participants with BB staff members on help desk)



(Sri Vijay Sharan, Treasurer and PRO, BB Society getting appreciation for his work during conference from Prof N. K. Mishra)



(Sri Vikash Kashyap, Asst. Manager, BBSC getting appreciation for his work during conference from Prof N. K. Mishra)



(Ms. Rashmi Kumari, Office executives, getting appreciation for his work during conference from Prof N. K. Mishra)

The benefit of this conference w.r.t. the society and the intelligentia of the state was the formation of a global core scientific council. Keeping in mind following aims and objectives.

1. To advance and promote the cause of science in Bihar.,
2. To hold annual conference at a suitable place in Bihar.
3. To hold seminars, workshops, orientation programmes as regular features.

4. To publish proceedings, journals for popularizing science and scientific achievements.
5. Providing guidance to BB society to start and execute the scientific project and help/support at any stage of the execution of the project.
6. To form research groups and recommend society to help those groups for their research project from the global network of B Brains.
7. Providing guidance, support and consultancy to govt. and non govt. agencies.

This global core scientific council has been formed with an intention of providing a common platform to the scientist's engineers and technologists of all categories belonging to different disciplines for sharing their expertise and experience.

The core scientific committee will comprise of 15 members from India in general and Bihar in particular. Each stream of science will have maximum three members. 120 more members preferably 2 from each stream from foreign countries will be a part of this committee. From India category Prof. Dolly Sinha will be the co-ordinator and Dr. Santosh Kumar will owe the responsibility of convener.

2nd Bihar Science conference has been decided to be organized in the P.G. Dept. of Biotechnology. College of commerce, M. U., from Jan 30- Feb 1, 2009.

Human Diseases and Their Genetic Basis

Prof. Jainendra Kumar

Professor and Head

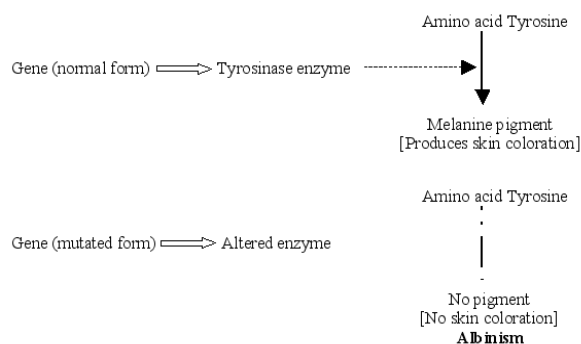
Department of Botany and Biotechnology
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Vast number of the ailments that human suffers can be categorized into three groups viz. (A) ailments resulting from body's adverse reactions in response to pathogenic infections such as from bacteria, viruses etc., (B) ailments that are symptomatic of some physiological imbalances, and (C) ailments that are due to inborn genetic defects. Even several of the afflictions belonging to group-A, and, mostly of group-B are caused due to pre-disposing factors that have genetic basis.

Mendelian disorders and inborn errors of metabolism

These are defects arising due to malforming nuclear genes that show vertical inheritance from parents to children following Mendelian mode of inheritance. Such defects are single-gene disorders resulting from the lack of or under-production of some enzyme/protein which is required to carry out a specific biochemical conversion in the system. Pathological condition in these cases is caused by the fact that the gene responsible to produce the required enzyme or protein has a mutated structure that codes for aberrant non-functioning protein/enzyme.

Example: Albinism (non-pigmentation in skin).



Human genome mapping has now located a number of such defect-prone nuclear genes on our 24 chromosomes. The knowledge of the location of these mutant genes is definitely going to help in the prevention and management of these genetic ailments. In addition to nuclear single-gene disorders, several of the human defects are caused by -

1. Chromosomal aberrations (Structural alterations in

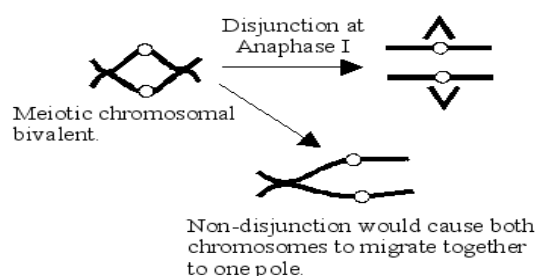
chromosomes),

2. Aneuploidy (Change in chromosome number)

3. Alteration in mitochondrial genes,

4. Somatic mutations, and

5. Alteration in multi-gene interaction pattern (Polygenic disorders).



Chromosomal aberrations

All structural aberrations in chromosomes result from chromosome breakage. Two sticky ends arise when a chromosome breaks. Repair mechanism tends to correct it immediately by rejoining the sticky ends. However, if more than one breaks have occurred, it falters and joins wrong ends in most cases causing aberrations. Such aberrant chromosomes would be inherited creating a lineage of these disorders in the family.

Aneuploidy

Aneuploidal changes in chromosomes are the result of :

- Non-disjunction of chromosomes during gametogenesis in parents,
- Chromosome lagging during cell divisions, and
- Chromosomal endoduplication.

Mitochondrial defects

Human mitochondrial genome consists of a single, circular and double stranded DNA with 16569 base pairs. It is present in multiple copies per mitochondrion. 37 genes of this genome code for 22 transfer RNAs, two types of ribosomal RNA needed for mitochondrial protein synthesis and 13 proteins required for oxidative phosphorylation process. Mutation rate in the mitochondrial genome is 10 times higher than that in the nuclear genome.



As mitochondria are inherited from the mother's side in multiple copies, the impact of a mitochondrial gene mutation is very high. The severity of mtDNA induced defects depends on whether the patient is homoplasmic (with all copies of the gene defective) or heteroplasmic (many copies of the gene defective but with few normal copies).

Leber's hereditary optic neuropathy (LHON) is a maternally inherited mutant mtDNA induced mid-life blindness caused by bilateral central vision loss due to atrophy of the optic nerve.

Somatic mutations and cancer

Cancers are mostly individual specific and result of somatic mutations (not inherited). Three groups of genes that induce cancer by mutations are-

1. Oncogenes (mutated versions of retroviral genes that were employed by the human cells to carry out some normal cellular functions),
2. Tumour suppressor (TS) genes (that inhibit cell proliferation), and
3. Mutator genes (genes responsible for correction of DNA damages).

Polygenic defects

These are the disorders caused through complex interaction of several genes and environmental components (i.e. pre-disposing factors). This group constitutes the major chunk of diseases that we suffer with. e.g. hypertension, diabetes, arthritis, multiple sclerosis etc. These diseases do not show a particular inheritance pattern and may be found more in one family than in others.

Translational genomics research

It is the research area that makes use of the knowledge and innovative approaches arising from the Human Genome Project for their application to the development of diagnostics, prognostics and therapies for cancer, neurological disorders, diabetes and other complex diseases. Human genome mapping has led the researchers to work out and translate variations in human genes to discover the underlying cause of individual-specific susceptibility, disease progression and resistance to therapy.

Mechanical Characterization of Solid Rocket Propellants

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Abstract

Solid rocket propellants are used in propulsion systems of rockets, missiles and launch vehicles because of their simplicity, ease of operation and less deployment time. Although propellants are supposed to burn and provide propulsive force to make various payloads airborne and propel them towards targets, they are also supposed to possess sufficient mechanical strength to counter a gamut of experienced loading conditions. Right from manufacture to transportation to storage to applications, they are continuously stressed by environmental changes (temperature and relative humidity), jolt, bump, self-weight, acceleration and internal pressure loading conditions. In nutshell, solid propellants, which are designed to give energy by combustion are supposed to have high mechanical strength to withstand various loads and retain their pre-defined shape till successful operation.

Current trend in propellant technology revolves around developing case-bonded solid propellant rocket motors for various applications for higher volumetric loading and increased range/payload requirements. Case-bonding stresses solid propellant a bit more. The mechanical properties of propellants, favourable for such case-bonding applications are high percentage elongation, moderate tensile strength and sufficient initial modulus.

Since current propellants are similar to highly filled (85-88%) polymers, their mechanical properties are combination of polymeric/elastomeric mechanical properties and particulate-matter mechanical properties. Additionally, propellant mechanical properties vary with temperature as well as strain rate. This leads to a highly complex behavior shown by solid rocket propellants.

This article gives a brief account of conventional approach for mechanical characterization of solid propellants. The effect of strain rate on initial modulus of propellants is explained and a correlation is obtained by regression analysis to predict initial modulus of solid propellant at different strain rate without actually testing them under all situations. A concept of uniform final modulus independent of strain rate is also introduced.

Introduction

All modern rockets, missiles and launch vehicles use solid propellants, based on casting technology. Main ingredients of solid propellants are polymer based binder (16%), solid oxidizer powder (68-85%) and metallic fuel powder (0-17%). Since both particulate and polymers are characterized by different types of mechanical properties, combined contribution of each ingredient is expected from solid propellants. Since stress-free temperature during propellant processing is higher than normal room temperature, solidified propellants are always under thermal stress during subsequent storage and transportation. After solid propellants are obtained, they are transported, where jolt, bump and vibrations are obvious loading environment. During storage, change in temperature and relative humidity of atmosphere, stresses propellants further. During rocket operation, hot combustion gases create high pressure inside rocket motor chamber, which loads unburnt part of solid propellants. Launch and Flight acceleration, sharp maneuverability in flight and air-thermo-chemical heating are some additional loads, experience by propellants during operation.

These all loads are considered during design of a solid propellant configuration. All solid propellant fulfill ballistic requirements to traverse a pre-defined trajectory, velocity and acceleration. Additionally, propellants must have sufficient strength to show structural integrity till successful completion of operation. Any design of solid propellant must have to satisfy ballistic requirements, processing requirements and mechanical properties requirements. Although ballistic and processing requirements are parts of system requirements, tailoring of mechanical properties remains in the purview of propellant manufacturers and structurally safe propellant for satisfying mission specifications is a major concern in modern era.

Background of Mechanical Characterization

Characterization of solid propellant as load bearing member has been stressed in several reports and papers. Importance of proper constitutive equations to predict mechanical properties of solid propellants are

discussed in NASA report¹ and effect of propellant compressibility, dependence of time and temperature are also established. Theoretical stress analysis and failure property generation are also discussed in this report. In yet another report from AGARD² (Advisory Group for Aerospace Research and Development), Finite element analysis is conducted for solid rocket propellants, shaped in various forms. Mechanical characterizations, elaborated in this report, are stress-relaxation test, uni-axial tensile test (STANAG 4506), poisson's ratio and bulk modulus determination. Similarly structural service life of propellant³ and effect of environmental conditions on cumulative damage⁴ are also point of discussion in papers.

Leaving these advanced techniques aside, in early 60s, propellants are characterized as viscoelastic material, behaving as rubberlike filled elastomers⁵⁻⁶. Time – dependent tensile properties, quasi-equilibrium modulus, Temperature dependence of mechanical properties are also illustrated. These generated properties are used for assessing structural margin of safety for actual systems⁷⁻⁹. Currently, several constitutive models are proposed by different scholars to express constitutive equations of propellant mechanical properties¹⁰⁻¹¹.

Experimental results

The uni-axial tensile testing of solid propellant sample in flat dog bone shape (critical cross-section area : $3.97\text{mm} \times 6.07\text{mm} = 0.241\text{ cm}^2$) as per ASTM specification is carried out in constant rate of loading universal testing machine. The strain rate is 50mm/min and gauge length is 45mm. A sample curve is shown in figure 1.

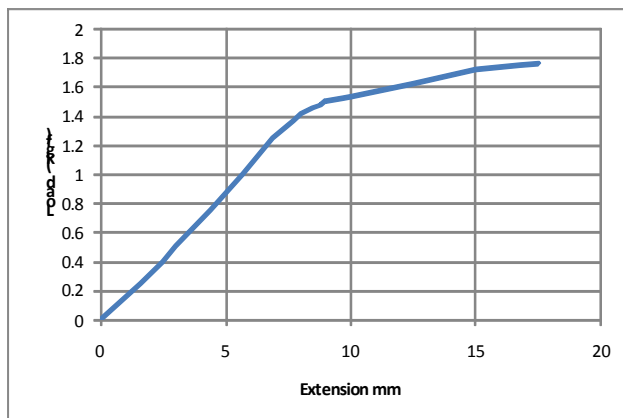


Figure 1. A typical Uniaxial Tensile testing curve

For this curve, value of initial modulus of propellant is calculated to be 32.76 kg/cm^2 ($1\text{ kgf} \times 45\text{mm}/(0.241\text{cm}^2 \times 5.7\text{mm})$). The curve is plotted upto maximum load or stress-level. Peak load is 1.76 kgf and extension corresponding to peak load is 17.5 kgf. From this, tensile strength is calculated to be 7.3 kg/cm^2 and percentage elongation is 38.88% ($17.5/45$). The propellant samples from same lot are tested at different strain rates like 5 mm/min, 20 mm/min and 200 mm/min. The values of tensile strength and initial modulus are represented in table 1. It is clear that as strain rate increases, both initial modulus and tensile strength increases. Percentage elongation at highest value of tensile stress is almost invariant with strain rate. A superposed curve of load extension is shown In figure 2.

Table 1. Variation of Mechanical Properties with Strain Rate

Strain Rate (mm/min)	5	20	50	200
Initial Modulus (kg/cm^2)	27.26	28.75	31.83	37.34
Tensile Strength (kg/cm^2)	6.10	6.47	7.30	7.78

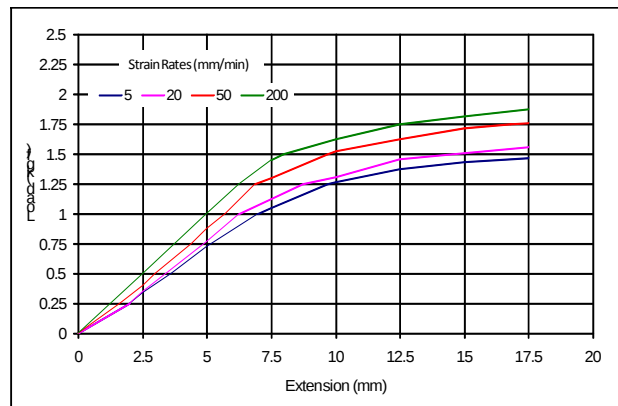


Figure 2. Force-displacement curve for propellant at different strain rates

Analysis and Discussion

It is clear from figure 1, that propellant samples show linearity upto around one-third of their extension till peak stress. It is also clear that polymeric binder is responsible for non-linearity in the behavior. Additionally, binders are polymeric masses, which show visco-elasticity or time-dependent or strain-rate-dependent behavior. Clearly propellant can be characterized as having two modulus values – one

initial modulus and one final modulus, later being much lower than initial modulus.

When propellant samples are tested at different strain rates, it is clear from figure 2 that initial modulus varies but final modulus remains same for each strain rate. Although forces are different in later part for different strain rate curves, the slope or modulus value remains unaffected.

The initial modulus varies with strain rate and higher strain rate gives higher modulus. This is because propellant cannot respond as fast as movement of grips in high strain rate situation and particulate behavior dominates over polymeric behavior. To simulate the change in initial modulus values, rotating load-extension curve by certain angle can be one alternative. With suitable selection of rotation angle, initial modulus can be made equal at different strain rates. The force-extension curves, rotated by suitable angle so as to match initial modulus at 50mm/min strain rate, are given in figure 3. Rotation angles for 5mm/min, 20 mm/min, 50 mm/min and 200 mm/min are 1.5° , 0.9° , 0° and -1.6° respectively. Similarly, all curves can be rotated to match any of the given strain rate curve. If 5 mm/min strain rate curve is referred then all the curves are to be rotated in clockwise direction (negative) and rotation angles are linearly varying and have values 0° , -0.6° , -1.5° and -3.1° for 5mm/min, 20 mm/min, 50 mm/min and 200 mm/min strain rates respectively.

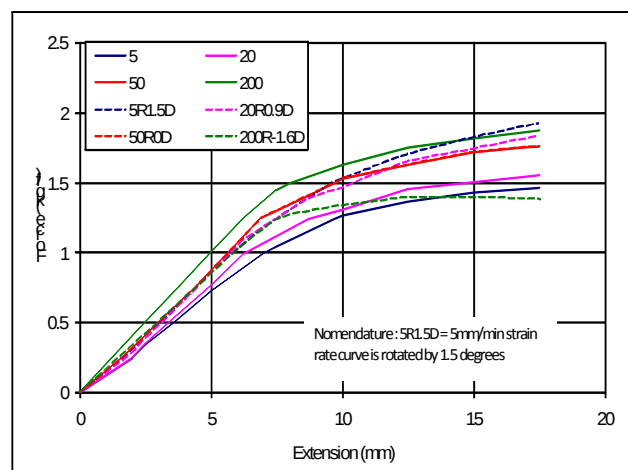


Figure 3. Force-displacement rotated curves for different strain rates

Similarly for equality of final modulus a linear translation in vertical direction may give superposed curve for different strain rates. The displaced curves with reference as 50mm/min strain rate curve are

shown in figure 4. Vertical linear displacements for 5mm/min, 20 mm/min, 50 mm/min and 200 mm/min are 0.265kgf, 0.19kgf, 0kgf and -0.129kgf respectively. Similarly any of the strain rate curves can be taken as base and linear translation in vertical direction can simulate final modulus for other strain rates. For example, if 200mm/min strain rate curve is considered as base or reference, then translation needed for equality of final modulus are 0.394kgf, 0.319kgf, 0.129kgf and 0kgf for 5mm/min, 20 mm/min, 50 mm/min and 200 mm/min strain rates respectively. With translation and rotation applied suitably, to curve generated at single strain rate, force-extension curves at all strain rates can be generated.

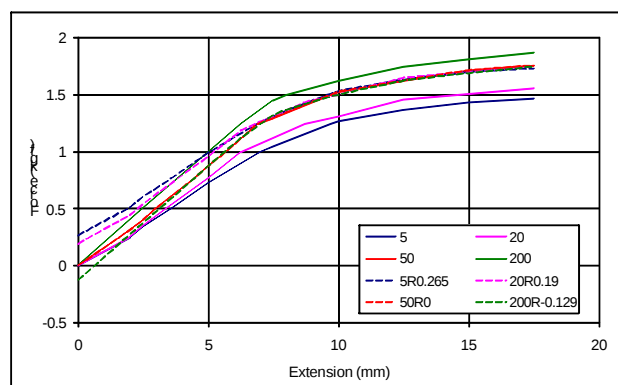


Figure 4. Force-displacement translated curves for different strain rates

Conclusion

From analysis it can be concluded that polymer behaves as linear elastic material till only one third part of maximum extension or strain. The initial modulus values are much higher than final modulus value. As strain rate increases, initial modulus and tensile strength of propellant increase. However final modulus value remains invariant for strain rate. A mathematical correlation for simulating initial modulus by rotation of and final modulus by linear translation of load-extension curve is also proposed in the article. This helps in reducing number of experiments for complete characterization of solid propellants for mechanical properties assessment.

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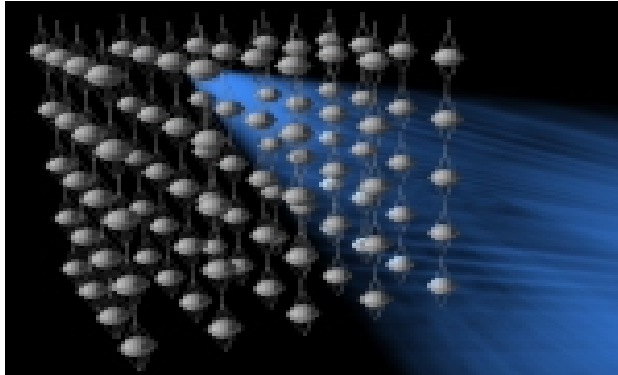
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Neutrinos Could Probe Earth's Structure

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Spotting neutrinos

Neutrinos are chargeless, almost massless particles which pass straight through the Earth unimpeded when they have a low energy, at energies above 10 TeV (10^{13} eV) they are very occasionally absorbed. This isn't the first time that atmospheric neutrinos, which are produced when cosmic rays collide with atomic nuclei in the upper atmosphere, have been proposed to probe the Earth's structure.

In the absence of a 6,000 km-deep hole to conduct observations, scientists hoping to learn about the internal structure of the Earth presently have few options but to monitor seismic waves. However, this technique, which relies on models of how waves are affected by rock properties, is indirect and so potentially unreliable. A truly direct method, suggest researchers from Spain, Japan and the US, might be to monitor the proportion of atmospheric neutrinos that are absorbed while passing through the Earth.

Since this absorption depends on the density of the neutrinos travelling medium, a neutrino travelling through a slice of the Earth close to the surface, for example, would be less likely to be absorbed than a neutrino travelling straight through the dense core. So by counting how many neutrinos come through different slices, it should be possible to see where the transition between the core and the inner mantle occurs, or between other structural layers.

It would be better to have a localized beam rather than a disperse one, but there is no such beam in nature that is intense enough.

Scientists widely dismissed the idea of using atmospheric neutrinos to probe the Earth's structure, however, because they mostly occur at lower energies. Although they had hoped that higher-energy cosmic neutrinos generated by supernovae and other astrophysical sources would be suitable, observations at the AMANDA neutrino telescope in the Antarctic have shown that such sources are too rare.

Now, **Concepcion Gonzalez-Garcia** from the University of Barcelona in Spain and colleagues say that atmospheric neutrinos may have been dismissed too hastily. Their calculations show that, although the proportion of atmospheric neutrinos above the 10 TeV absorption criterion is low, the sheer number of them could make up for it. "It would be better to have a localized beam rather than a disperse one, but the point is that there is no such localized beam in nature that is intense enough,"

Cold observation

Not any neutrino detector is up to the job, though. The researchers think that sufficient numbers of atmospheric neutrinos could only be detected with AMANDA's successor, known as **IceCube** — a network of about 70 light sensors on strings that are currently being buried two-kilometres deep into the Antarctic ice. Neutrinos passing through ice will occasionally have a chance interaction with an atomic nucleus and produce a subatomic particle called a muon, which travels at high speed while producing so-called Cerenkov radiation. When this radiation reaches one of IceCube's light sensors, it registers the presence of a neutrino.

To calculate the number of atmospheric neutrinos that could be recorded in this way, Gonzalez-Garcia's group integrated the area of IceCube and multiplied it by the flux of atmospheric neutrinos produced on one side of the Earth given by a theoretical model.



Ice Cube Experiment

They then had to reduce the value to allow for various attenuating factors: the varying density of the Earth, inelastic scattering, and the possibility of oscillation — that is, a neutrino fluctuating in type or “flavour” over long distances.

The researchers estimate that about 1000 neutrinos would have to be detected to observe the density transition from the Earth’s core to its mantle with 99% accuracy. Given that IceCube now has installed just 13

Manthan

of the 70 sensor strings and will not be completed before 2010, this observation could take from four years to a decade.

Although this seems like a long time for information that has already been revealed by seismic measurements, Gonzalez-Garcia’s group point out that such measurements rely too heavily on models that have not been verified by independent methods. “The case for direct observations using an alternative method is compelling,” they say.

India is also geared up to make one of its biggest underground laboratories to observe the neutrinos and determine some of its characteristic properties which are still not known. Many Universities in the country are collaborating to make the experiment namely **INO-(India based Neutrino Observatory)** a success. The Lab once set up may become one of the long base experiments to actually observe neutrino Oscillation and of course give greater details about the internal structure of earth itself.



Science & Technology in India: Before and After Independence

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Abstract

Before Independence we had four Nobel Laureates for their work in India. After Independence we have five Nobel Laureates of Indian Origin but no Nobel Laureate who had been awarded for his work in Indian Universities or Research Lab. This enigma can be solved if we look at developments in PRE and POST Independent India. In Colonial India, Britishers had established three Presidency Universities, eight Research Establishments from utilitarian point of view, seven Research Institutions and one University had been established due to persistence of Visionary Patriots J. N. Tata and their like. All these Establishments and Institutions were World Class with no compromise on Professional/Academic Excellence. After Independence we have 400 National R&D lab, 231 Universities and 1300 in-house R&D. Still our quality of Research has fallen over the last six decades because of serious compromises made on Professional/Academic Accountability. In 1981-94 period our share of Global Research Papers was 2.4%, our share of Global Citation was 0.7%, Relative Citation Impact was 0.27 and percentage of GDP spent on R&D was 0.7%. We also occupied NINTH position in 10 most Active Countries in Scientific Publication. By the year 2006 the same has stagnated below 3%, percentage of GDP spent on R&D remains at 0.7% and we have lost our position of eminence among the ten most active countries to China. China today is in FIFTH position and is vying for the SECOND position among the 10 most Active Countries in Scientific Publication. Among the best 500 Universities today we have only 3 Universities whereas China has 8 Universities. We have the capacity to produce 15000 M.Techs but we are producing only 5000 M.Techs. A large number of Engineering Graduates are going into Software Industries and Information Technology Industries. So we are having a serious dearth of Ph.D. students leading to acute shortage of teachers in Engineering College and Science Colleges. Our Private Sector Capital Base is \$300 billion out of which \$200 billion is concentrated in 36 families still only 0.1% of total turnover is being spent into In-house R & D which is 15% of the total R & D funding in India. State share in R & D is only 0.1% of total outlay. If all these

developments are taken into account then we can account the enigma as to why we lack a Nobel Laureate working in Indian Research Environment. Under the circumstances a concerted effort needs to be made by State as well as the Center for revamping the University Systems, incentives have to be given to the Private Sector for increased In-house R & D and Research Institutes have to realize that Real life National Industries are the source of Research Papers. But most of all a system of Professional/Academic Accountability has to be made operative and respect for Professional/Academic Excellence and Integrity has to be restored which was present in British Times but is totally lacking today. This also raises the question that China has succeeded where India has failed though both started with the same initial conditions. British had a Bourgeoisie Mindset. They obeyed the laws and made their subordinate in their Colonies to obey the same. There was no exception. Even Lord Clive was tried by law and punished for his financial irregularities. But independent India is a Bourgeoisie Democracy in name. In essence it still remains Semi-Feudal and Semi-Colony of SuperPowers. Casteism, Nepotism and Sycophancy rules the roost. Such is not the case with China. It has a set of Rules and Laws and it makes sure that all live and play by the same Rules and Laws. Rule of Law is not an exception in China nor was it in British India. But in Independent India it is the Rule of Connections. If you are properly connected you can break the law with impunity.

Indian science & technology in British India[1]

British came as Mercantile Traders humbly seeking trading rights in the Royal Courts of Jehangir in 1650's. This was the era of Mercantile Capitalism. In 1757 Governor General of East India Company, Lord Robert Clive aggressively pursued his marketing rights which resulted in Plassey's Battle in which Nawab of Bengal met his ignominious defeat due to the treachery of Mir Zafer. East India Company was hell bent to seek its Trading Rights by all means including force. In next hundred years they turned whole South Asia extending from Afganistan to Burma into their Captive Market. East India Company tried to maim our Indian



Artisanship as much as they could and compelled us to trade with them on unequal terms. They turned India into their raw material and minerals appendage. Mechanized Production had started in Britain. This was the era of Industrial Capital. Their excess Industrial Produces had to be dumped at huge profits and there could be no better place than their Colonies. Their indiscriminate exploitation of our agricultural resources, mineral resources and maiming of our artisans led to Nation Wide Revolt culminating into First War of Independence. Lack of a Party and an Ideology led to the failure of this popular uprising. East India Company was replaced British Crown and British Empress officially became the ruler of British India. This was the time when Laissez faire Capitalism was being replaced by Cartels, Syndicates and Monopolies. This was the period when Industrial Capitalism was being replaced by Finance Capitalism. This was the period when Export of Commodities had to be replaced by Export of Capital. Direct Investment of British capital in South Asian Continent demanded trained personnels plus a modern Infrastructure. In Lord Macaulay's words,

“ We must presently do our best to form a class of persons who are Indians in blood and colour but English in tastes, in opinions, in morals and in taste.”

With this objective and with the objective of laying down the much needed infrastructure for their ongoing investments, our Colonizers from their utilitarian point of view had created World Class Transportation, Tele-Communication and R&D Infrastructure. Table(1) tabulates the R&D infrastructures and the objective with which they were built. Each of this was there for a certain objective – not just Research for fundamental enquiry but Research which will have commercial spinoffs. This objective was relentlessly and rigorously pursued. There was never any relaxation in Accountability, Excellence and Integrity. Thus a Research Environment was created where Nobel Laureates like C.V. Raman and Ronald Ross were groomed and allowed to bloom into their full glory. It was this environment which also prepared our Visionary Engineer Visheshwarya. Table (2) gives the list of Nobel Laureates of Indian Origin before and after Independence. Now let us see what happened after 15th August 1947.

Indian science and technology in independent india.

On the midnight of 14th-15th August 1947 our Nation and our Representatives made a tryst with Destiny.

'Long years ago we made a tryst with destiny, and now the time comes when we shall redeem our pledge, not wholly or in full measure, but very substantially. At the stroke of the midnight hour, when the world sleeps, India will awake to life and freedom. A moment comes, which comes but rarely in history, when we step out

from the old to the new, when an age ends, and when the soul of a nation, long suppressed, finds utterance. It is fitting that at this solemn moment, we take the pledge of dedication to the service of India and her people and to the still larger cause of humanity.'

At this moment of time on 18th March 2008 almost 60 years after that historic utterance of our Visionary Leader Pandit Jawaharlal Nehru, I would like to ask our present set of leaders if indeed that pledge of EQUALITY of OPPORTUNITY and STATUS, enshrined in the preamble of our Indian Constitution, has indeed been redeemed. This question will be answered at the conclusion of this article.

Nehruvian Model of Development based on Socialism, Centralized Planned Economy and National Ownership of Producer Industries was put forth. Education and Health Care was to remain under Public Control.

Today in 2008 we have increased our Education and R&D Infrastructure manifolds as is evident from Table(3).

1947	2008
15 National R&D facilities.	400 National R&D Laboratories
4 Universities	231 Universities
?	1300 in-house R&D facilities
50 per 100,000 college enrolment	613 per 100,000 college enrolment (corresponding figure for USA is 5,399 per 100,00)

We have Department of Space which has put us in Space League amongst the community of Nations. Today we have commercial launching capabilities. We have remote sensing and communication Satellites and the most powerful launch vehicles which can launch Intermediate Range Ballistic Missiles(ICBM).

Under the able guidance of InterUniversity Center for Astronomy and AstroPhysics, Giant Meter Wave Telescope has been established which is carrying out pioneering Research in the field of QUASERS and Pulsars. Under the able guidance of Center of Advanced Computing and with the application of Karmakar Algorithm and active participation of Narendra Karmakar, we have been able to develop Tera FLOPS Super Computer which is equal to the best super computer in the World. Our Public Enterprises have been able to manufacture all the needed Power Plant Equipments thereby making us free of Foreign Dependence. Same is the story of Department of Atomic Energy. Today we have Uranium enrichment facilities, heavy water manufacture facilities and we have several Atomic Power Plants working successfully in different parts of our country.



We have been able to develop indigenously 40,000 line Digital Switching Technology which has enabled the Modernization of Telecommunication Infrastructure. Our Drug and Pharmaceutical Industries have also grown from Rs 4 crores in 1947 to Rs 7000 crores with

Rs100 crores invested in Drug related R&D. Our Software exports are growing at 50% per year rate.

Table(1) Growth of Scientific Institutions before Independence[1]

Year of establishment	Name of Institution	Purpose of establishment	Person behind it
1767	Survey of India	Preparing Maps	
1851	Geological Survey of India	Exploring minerals and oil-wells	
1857	Indian Meteorological Department	Weather Forecasting	
1857	3 Presidency Universities: Bombay, Calcutta and Madras	For imparting World Class Education and carrying out Research	
1876	Indian Association for Cultivation of Science, Calcutta	For carrying out Research. Raman Effect was discovered here.	Mahendralal Sircar
1890	Botanical Survey of India	For exploring the Flora Reserve of India	
1896	Halfpenny Institute of Mumbai	For developing Vaccines	
1903	Agricultural Research Institute, Pusa	For Agricultural research	
1906	Forest Research Institute, Dehradun	For Forest Research	
1909	Indian Institute of Science, Bangalore	For Scientific Research in all fields of Physical Sciences.	J. N. Tata.
1911	Indian Research Fund Association	For Research in Life Sciences.	
1916	Benars Hindu University, Benaras	For Research and Education in both Physical and Life Sciences	Madan Mohan Malviya.
1930	National Academy of Sciences, India.	For Research in Astrophysics and allied Physical Sciences	Meghanand Saha-authored a treatise on Heat
1931	Indian Statistical Research Institute, Calcutta.	For Research in Mathematics	P.C. Mahalanobis
1934	Indian Academy of Sciences, Bangalore	For Research in Physics	C.V. Raman
1935	Indian National Science Academy, Delhi	Umbrella Organization for coordinating Research in Life Sciences as well in Physical Sciences.	
1942	Council of Scientific and Industrial Research	For setting up and coordinating Research in various parts of the country in every conceivable area of Scientific and Technical Research.	A. Ramaswamy Mudaliar, B. S.S.Bhatnagar



Table(2)Indian Laureates Before and After Independence[Wikipedia].

Indian Nobel Laureates before Independence			Nobel Laureates after Independence		
Year of Award	Name of the Awardee & Nationality	Field of Award & Place of Research	Year of Award	Name of the Awardee	Field of Award & Place of Research
1902	Dr. Ronald Ross, Englishman.	(1)MEDICINE (2)Presidency General Hospital , Kolkota,	1968	Dr. Har Govind Khurana, Indian later became US citizen.	(1) MEDICINE (2) USA
1907	Ruydurd Kipling, Englishman.	(1)LITERATUR E (2)Shimla	1979	Mother Teresa, Bulgaria	(1) PEACE (2) Kolkota
1913	Rabindra Nath Thakur, Indian.	(1) LITERATURE (2)SantiNiketan University, Bengal	1983	Dr. S. ChandraShekher, Indian later became US citizen	(1) PHYSICS (2) Chicago University,US A.
1930	Dr. C.V. Raman, Indian	(1)PHYSICS (2) Indian Association of Cultivation of Science, Kolkota.	1998	Dr. Amratya Kumar Sen, Indian.	(1) ECONOMICS (2) Cambridge University,Eng land
			2001	Vidyadhar Surajprasad Naipaul, Englishman of Indo-Trinidadian Origin.	(1) LITERATUR E (2) England.
			2007	Rajendra Prasad Pachauri, Indian.	(1) PEACE (2) Inter-Governmental Panel, USA.

Tata Research Development and Design Center (TRDDC) established in 1981 has emerged as a viable profit making R&D facility which does sponsored Research for Private and Public Industries, Indian and foreign both.

Small-Scale Industry is a vibrant and dynamic sector with 2.3 million units, producing 7000 items and providing jobs to 14 million workers which is 10% of total work force. SSI provide 40% of Merchandise Exports.

This clearly shows that we have a large and modern infrastructure which has made its marks where Government has shown political will e.g. in the field of Space Technology, Computer Technology, Atomic Power Plant, Telecommunication and Software Technology.

Our Private Industrial Assets is \$ 300 billion worth. We have 36 business houses who figure in Forbes Billionaires List still none of the top 100 brands belong to Indian Business House. Furthermore we have missed the Integrated Circuit Technology revolution. We even today have no Silicon IC Fabrication facility barring Semiconductors India Limited Chandigarh which is more of a Govt. Show piece.

We were an Agrarian Economy and the objective of Nehruvian Model was to turn India into a Self-Reliant Industrial Economy which we still are not. Industries constitute only 19.3% of GDP, Agriculture constitutes 19.8% and Service Sector constitutes 60.8%.

Why do we remain a developing economy?

**The malady of our economy.**

During the growth of Civilization we have moved through three stages:

(i) Labour Intensive Method of Production which was primarily Agricultural Economy;

(ii) Capital Intensive Method of Production which was Industrial Economy;

(iii) Knowledge Intensive Method of Production which is today's Post Industrial Era.

In the present era, generation of Scientific Knowledge is intimately linked to GDP and per capita GDP as is evident from Figure 1.

FIGURE 1. Comparing economic and scientific wealth.[3]

From the following article:

[The scientific impact of nations](#)

David A. King

Nature 430, 311-316(15 July 2004)

doi:10.1038/430311a

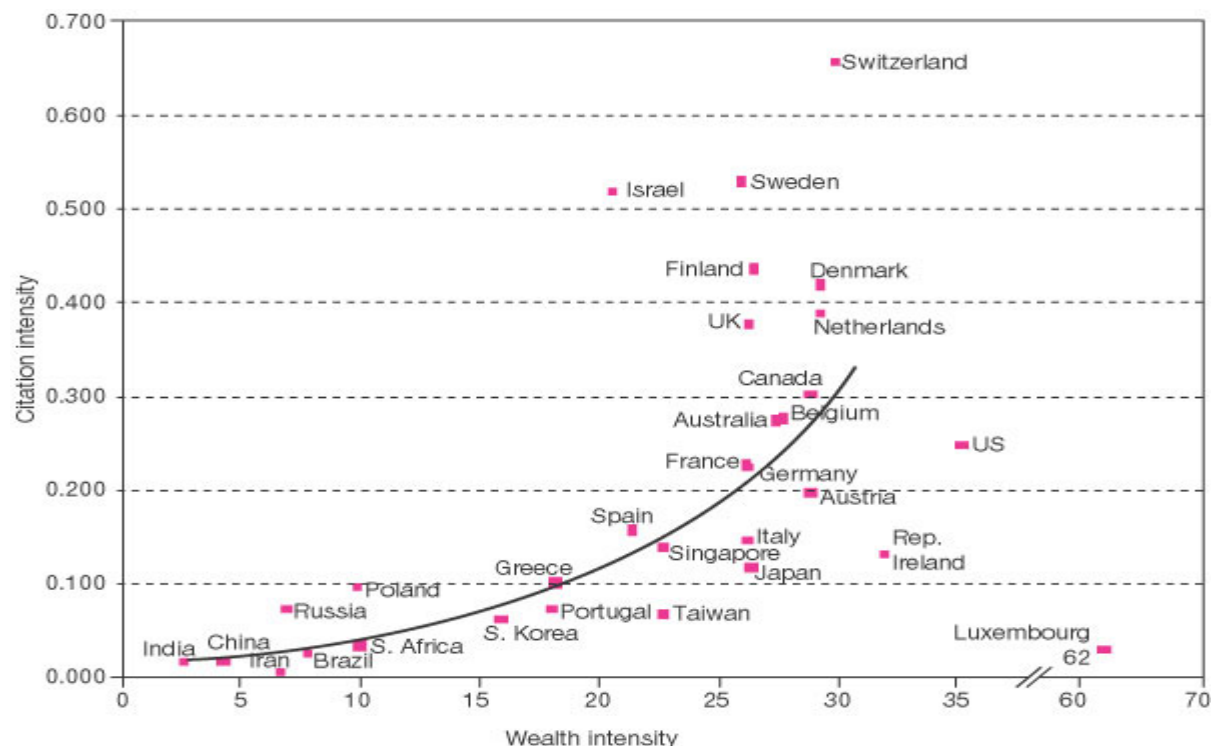


FIGURE 1. National science citation intensity, measured as the ratio of the citations to all papers to the national GDP, shown as a function of the national wealth intensity, or GDP per person, for the 31 nations in the comparator group. GDP and wealth intensity are given in thousands of US dollars at 1995 purchasing-power parity. Sources: Thomson ISI, OECD and the World Bank.

As seen from the Graph ,National Science Citation Intensity is directly related to Wealth Intensity where the two terms are defined as follows:

Citation Intensity= (Total Citations/GDP)

Wealth Intensity=(Total GDP/Total Population)

The Scientific Publications of top 31 countries and their Citations have been studied in detail from 1981 to 2005[2,3,4].

TABLE 4. World's 10 Top Countries in Scientific Publications in descending order.[4]

Countries	1991 (%)	Countries.	1998 (%)	Countries	2005 (%)
USA	35.6	USA	32.3	USA	30.5
GBR	8.6	JPN	9.2	JPN	8.3
JPN	7.6	GBR	9.2	GBR	8.2
DEU	7.3	DEU	8.7	DEU	8.1
SOV	5.6	FRA	6.3	CHN	7.5
FRA	5.5	CAN	4.2	FRA	5.7
CAN	4.7	ITA	4.0	CAN	4.5
ITA	3.1	RUS	3.5	ITA	4.4
IND	2.4	ESP	2.8	ESP	3.3
AUS	2.2	AUS	2.7	AUS	2.9



As can be seen from the Table 4. in 1991 India was at ninth position with 2.4% of share in Global Publications whereas by 1998 onward it is no more in top ten whereas China which was far behind in total publication as well as in total citation in 1981 has surged forward to 5th Position in top 10 in terms of total Publications and it is likely to achieve 2nd position in next couple of years.

Table 5. does a comparative demographic comparison of India , China and USA. In the year 2006 [5]

Resource	India	China	USA
Land Mass (million. sq. km)	3.29	9.6	9.63
Population (billion)	1.1	1.31	0.298
Median Age(Yrs)	24.9	32.7	36.5
Birth Rate/1000	22	13.3	14.1
GDP(1) Trillion Dollars	3.61	8.86	12.36
GDP(2) Trillion Dollars	0.72	2.23	12.49

1. Purchasing Power Parity, 2. Official Exchange Rate.

Table 6. gives the scenario of Scientific Publication, total Citations gathered and %GDP invested in R&D in the period 1981-1994. [2]

TABLE.6. Comparison of total number of papers, total citations and % GDP for India and China. (1981-1994)

	India	China
% of Global Publications	2.4	0.9
% of Global Citations	0.7	0.3
Relative Citation Impact =(% citation/%publication)	0.27	0.27
% GDP invested in R&D	0.7	0.5

Both India and China were agrarian economies coming out of colonial bondage and facing equal intensity of poverty, illiteracy and unemployment. China was ostracized by USA and Capitalist Worlds and later it was boycotted by Soviet Union also. Then how come China was able to bring itself out of morasses of poverty and illiteracy and we seem to be sinking deeper and deeper in the same.

Just as in British India there was accountability and professionalism , China had the same kind of work ethos though because of altogether different reasons. British had to extract the maximum from us for all their investments in their colonies whereas for China it was the question of very survival surrounded by capitalist sanctions and trade embargoes. This unfortunately has been lacking in India.

The Ruling Class in India is totally blinded by greed and avarice so much so that it has lost the very National Perspective. It is this loss of National Perspective which is compounding the problems and leading to secessionist and revolutionary movements

through out the country. Under the circumstances all well meaning plans of poverty alleviation and employment generation fall on their face without reaching any of its objectives.

IV. REMEDY AND CURE OF INDIAN POLITICAL ECONOMY.

Following are the recommendations in the bleak and desperate situation we have fallen into as a Nation:

(1) The rot which has set in every level of education right from Primary Level through Secondary Level to Graduate and Post Graduate level have to be urgently addressed;

(2) British atleast had a system of training first rate Babu Engineers, Babu Doctors and Babu Clerks;

(3) In Independent India we are still producing Babus only through our educational systems but not first rate. Our Babus are second rate and third rate professionals not ready to face the challenge of building a Modern India;

(4) State participation in building R&D facilities have been negligible in plans after plans. In 8th Five Year Plan total outlay of States and Union Territories was Rs 182,000 crores but only Rs 200 crores was allocated to S&T Infrastructure. This comes out to be 0.1% of the total outlay. States donot see that S&T is the only weapon by which they can fight poverty, unemployment and illiteracy;

(5) Private Business Houses have equal capital base as compared to Public Sector Enterprises i.e, of \$300 billion still Private Business contribution to R&D efforts is only 15% of the total. It must be 50:50;

(6) It must be realized that Research cannot be done for Research sake it has to be linked with Real Life Industries.

But these recommendations become meaning less until the rule of law is established in this country where the rich and powerful are flouting the law with impunity.

Acknowledgment

I would like to express my gratitude to BBrains Development Society for their pioneering effort to start an intellectual ferment and thereby start a new era of research and enquiry.

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Post Sript: On 15th January 2008 , Drug Controller General of India cancelled the production license of three Public Sector Undertakings for Vaccine-Manufacturing. These Public Enterprises did not comply with Good Manufacturing Practices Norms as set under the Indian Drugs and Cosmetics Act of 1945. These Unit are:

(1) Central Research Institute, Kasauli, Himachal Pradesh;

(2) Pasteur Institute of India, Coonor, Tamil Nadu;

(3) BCG Vaccine Laboratory , Chennai, Tamil Nadu.

Since 1978, under Expanded Programme of Immunisation, these companies produced the bulk of vaccines for six vaccine- preventable diseases namely: diphtheria, pertussis, tetanus, poliomyelitis, typhoid and childhood tuberculosis. In 1985 this programme was upgraded to Universal Immunisation Programme(UIP). Under UIP typhoid was replaced by measles. Thus under UIP we have Bacillus Calmette-Guerin(BCG) vaccine, the triple diphtheria-pertussis-tetanus (DPT) vaccine, the oral polio vaccine(OPV) and the measles vaccine.

This is a serious blow to our self-reliance and indegenisation objective and it reflects upon the state of higher education. If there were academically sound people they would never compromise on standards and norms. But they did and the result was catastrophic. Today even the vaccines in their stock are not being permitted to be used for UIP.

This story of compromise today is the common theme through out all technical and academic institutes leading to sub standard engineers, doctors and academicians and hence to production of sub-standard products.

TABLE 5. Comparative study of Technical Manpower in India and US.

	India 2008	USA 2008
Engaged in R& D	116,000	1.3 million
Per Capita Manpower	110 per million	4500 per million
Science Graduates per yr	9 million	
PG Science per yr	2 million	
Ph D's per yr	100,000	
Fresh Science Enrolment per yr	2 million	
Fresh Engineering enrolment per yr	700,000	
Private Sector contribution to R&D	14%	63%
IT-BPO Industries	8-10% of our 495,000 engineering graduates qualify. Several Thousands Graduates hired from outside.	

River Linking Projects: Impacts and Consequences

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Abstract

Agriculture which is the mainstay of Bihar economy suffers from drought and floods. Almost one-sixth of the total flood-affected areas of the country is in Bihar engulfing as high as 69 lakh hectares under it grip. Flood bring widespread damage to life and property, particularly to the weaker sections of society. In the presenario, the subject of interlinking of rivers is a matter of interest which is seen as a measure for sustainable control over water resources. This paper will focus on conceptual issues relating to RLP (River Linking Project) as well it identifies and enumerates the possible impacts on the nature and extent of some of these impacts.

Keywords: River Linking Project, Flood

Introduction

Agriculture is the mainstay of Bihar economy which suffers severely from drought and floods. Almost one-sixth of the total flood-affected areas of the country is in Bihar engulfing as high as 69 lakh hectares under it grip. Flood bring widespread damage to life and property, particularly to the weaker sections of society. In this paradoxial situation, suggestions for the transfer of water from surplus areas to deflict areas. Earlier Proposals, Dr. K. L. Rao's - National Water Grid, 1972 and Dr. D. J. Daster's - Garland Canals, 1977 but, these proposal were not found feasible and dropped. River Linking Project (RLP) identifies and enumerates the possible impacts on the nature and extent of some of these impacts.

Materials and Method

In this investigation the parameter considered may be as follows: -

Judging the slope of the land because the river flows according to the gravity of slope. The source region of the basin from where they originate and aerial extent of the source region. The quantity of water found in the rivers. Agricultural development survey before XIth plan period and after XIth plan period. Differences in rearing fishes as fish catch in the river. The process of

navigation and its usability in the area for socio economic development. Measurement of the process of alluviation and diluviation. Measurement of the area and amount of silt deposit.

RESULT AND DISCUSSION

River Linking Project (RLP) is initiated on 25th August, 2005 namely "Amrit Kranti" which is most awaited project since 1972. National Water Development Agency

As a result, the National Water Development Agency (NWDA), was set up in 1982 by the GOI under the ministry of Water Resources as an Autonomous Society to study the feasibility of the national perspective as formulated by the Ministry of Irrigation. The NWDA has come up with a proposal after some studies.

The proposals consists of two components viz.,

- The Himalayan Component
- The peninsular Component

The Himalayan Component

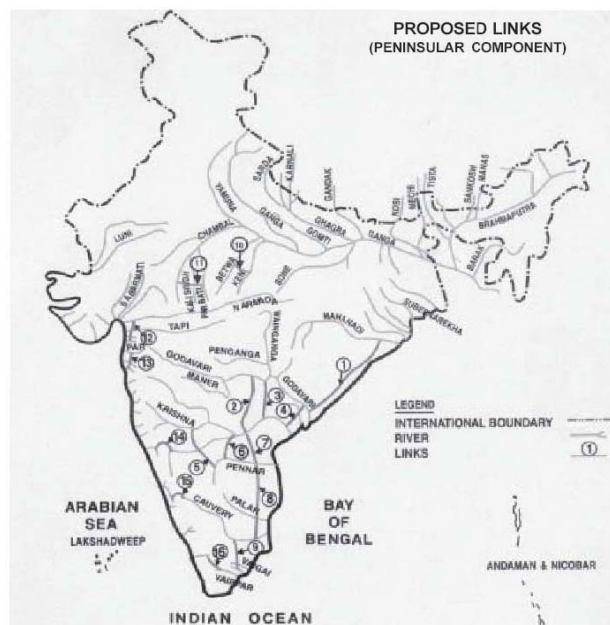


- Manas-Sankosh-Tista-Ganga
- Kosi-Ghaghra
- Gandak—Ganga
- Ghaghra-Yamuna
- Sharda-Yamuna
- Yamuna-Rajasthan



- Rajasthan-Sabarmati
- Chunar-Son-Baraj
- Son-Dam-Associates River of Southern Ganga
- Ganga-Damodar-Suwarnrekha
- Suwarnrekha-Mahanadi
- Kosi-Mechi
- Farakka-Sunderwan
- Jogigopa-Tista-Farkka

The peninsular Component



- Mahanadi-Godawari
- Godawari-Krishna
- Krishna-Pennar
- Pennar-Kawaeri
- Kaweri-Wegai-Gundar
- Ken-Betwa
- Parwati-Kalisindh-Chambal
- Par-Tapti-Narmda
- Daman Ganga- Pinjal
- Bedti-Warda
- Natravti-Hemwati
- Pamba-Achankowil-Weipar

The RLP will involve large scale intervention in the natural hydrological system of the country. Implementation of RLP will require construction of large dams, barrages, distribution systems including cross-drainage works, to store water at strategic points and to distribute it to the farthest points to harmonize the spatial and temporal demand-supply disparity. Apart from the impacts on the social and economic aspects of the country. Most of these impacts are interactive in nature i.e., change in one aspect will

bring about changes in other aspects as well.

Impact on the Environment

- Rehabilitation of the project affected persons
- Sedimentation of Reservoirs
- Waterlogging of agricultural land
- Submergence of mineral deposits and archaeological monuments/shrines
- Aquatic life
- Submergence of rare species of flora and fauna
- Health impact
- Water quality
- Impact on Climate

Impact on the Environment

- Reservoir Induced Seismicity (RIS)
- Environmental Impact during construction
- Obstruction to cross country drainage due to excavation of large link channels across the general slope of the country
- Eutrophication in reservoirs
- Change in ground water table
- Impact on society and wild life due to introduction of canals cutting across social communication as well as wild life movement path
- Reduction in flow in lower riparian part of the basin
- Terrain Capability

Reservoir Induced Seismicity (RIS):

The disastrous earthquake at Koyna reservoir, Maharashtra and the failure of the Vaiont dam in Italy (Loss of 2600 human lives) put a big question mark on the question whether earthquake can be induced by the filling of a reservoir. These conditions arise when the existing rock strata arrangement is earthquake prone and additional pressure due to filling of reservoir may trigger off a strong earthquake.

Environmental Impact During Construction:

Following factors may put adverse effects on Flora and Fauna of the forest land:-

1. Movement of heavy earth moving machinery.
2. Presence of a large number of workers.
3. Blasting of rock strata etc. Pollutions from automobiles, including noise pollution disturb the living condition of the wild animals.

Obstruction to Cross-country Drainage due to excavation of Large Link Channels across the General Slope of the Country:

These link channels are likely to be aligned along the general slope of the country.



As a consequence, serious drainage congestion is bound to happen in the upstream side of the channel banks inspite of construction expensive cross – drainage works.

Change in Ground Water Table (GWT):

Due to introduction of dam reservoirs and long large channels, the GWT will rise. It proves to be an asset for the dry and parched land in Bankura district, where the emergence of the reservoir and the canals implemented in the Kangsabati reservoir Project brought in more water during summer in the wells and tanks. here may be some adverse effects also due to GWT like water logging of agricultural lands in some area.

Impact Due to Lower Flows in Existing Rivers and Channels on River Regime, Water Equality and Ecology:

Lower flows have a baneful effect on the downstream reach of the river. This may affect morphology of the channel, aquatic biota, induce ingress of salinity in coastal regions Lower flows limit the capacity to reduce pollution through dilution.

21. Larger flows overflowing river banks, help in

building up the flood plains, adding nutrient laden sediments, cleaning up the area, providing fish spawns These spawns add to the culinary delight of the people devours the mosquito larva restricts propagation of Malaria and other mosquito borne diseases.

Conclusions

The anticipated issues in all aspects should be identified and properly articulated. Detailed plans should be made public and a national debate should be initiated. In view of the water crisis looming large in certain areas and considering that economics of water will undergo radical change in the coming years it is surmised that the concept of inter-basin transfer cannot be summarily rejected. Any intervention which is likely to affect the trans-boundary co-basin countries adversely has to be sorted out and a satisfactory agreement reached well ahead of implementation.

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Entomofaunal Diversity of Daha River in Siwan

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Introduction

Insects are tracheates arthropods, undoubtedly form, the most successful group in the animal kingdom. It is estimated that more than 1 million species have been described. Insects are aquatic and terrestrial both. Truly aquatic insects are those that spend some part of their life cycle closely associated with water either living beneath the surface. Less than 5% of the insects are aquatic.

Insects are aquatic macro-invertebrate. They are intimately related with the environment. Any alteration produced in the physical or chemical status of a riverine ecosystem becomes recognizable through the community structure of the organization. In fact the presence and absence of certain species or of their associations can give a fairly accurate estimation of the degree of pollution present. Insect or Entomofaunal diversity acts as a tool for making an integrated assessment of water quality in the river. (Met Calfe & Smith : 1994, Kar 1991).

Materials and Methods

Daha-river originates from a chaura of small village name Sasamusa of Kuchaikot at Goplaganj district. This river walks its own mood through Siwan which is located in North-Western part of Bihar, an inter fluvial region of the river Ghaghra and Gandak. This district extends from 25°00' N to 26°52' N to latitude and 84°00' E to 84°47' E Longitude. This river is moderately polluted and received distillery - effluents during some season and sewage from town.

During the present study from Nov. 2005 to Dec. 2007) Insect were collected from different sites with the help of ordinary hand pond net. The Entomofaunal sample were collected and brought to the laboratory and preserved in 70% alcohol or 5% Formalin. Macro invertebrates were identified by using standard key and book of "Fresh Water Invertebrates by Robert W. Pennak (1978) and S. Mani (1982).

Results and Discussion

The study revealed that insects were comparatively more abundant than molluscs and other aquatic

invertebrates Entomofaunal diversity of Daha river has 22 species belonging to the following - Seven Taxonomic orders. These were - Ephemeroptera, Odonata, Plecoptera, Hemiptera, Trichoptera, Coleoptera and Diptera. Eighteen families of these orders are :- Gerridae, Notonectidae, Pleidae, Nepeidae, Corixidae, Belostomatidae, Culicidae, Chironomidae, Tanyodinae, Simuliidae, Heleidae, Ephrydidae,

List of Entomofaunal Recoded from River DAHA
during the period of Investigation

ORDER	SCIENTIFIC NAME	COMMON NAME
Ephemeroptera Odonata	(1) Ephemeroptera (1) Dragon flies (2) Damsel flies	May flies Dragon flies Damsel flies
Plecoptera Hemiptera	(1) Stone flies (1) Gerris (2) Notonecta (3) Neoplea (4) Nepa (5) Ranatra (6) Corixa	Water strider Back swimmer Pigmy back swimmer Water Scorpion Water Scorpion Water boatman
Trichoptera Diptera	(1) Caddis flies (1) Culex (2) Chironomid (3) Tanytopodium (4) Simulium (5) Ceratopogon (6) Ephrydra (7) Tabanus	Case-bearer Culex larva Blood worm Black flies Sand flies Shore flies Horse flies
Coleoptera	(1) Beetles (2) Dytiscus (Hyphorouss) (3) Gyrinus (4) Hydrophilus (5) Sternolophus (6) Dineutus (7) Halipus	Shield Wing beetles Predaceous diving beetles Whirling beetles Water Scavenger Whirling beetles Crawling water beetles

Syrphidae, Tabanidae, Dytiscidae, Gyrinidae, Hydrophilidae and Haliplidae.



There are some interesting insect present in this river. These are Belostoma and Neoplea. In Belostomatidae family - Belostoma spheroderma, the female cement their eggs on the back of the male and male carries them about for a week. The number of eggs may be 150. In pleidae, Neoplea or pigrny (back swimmers) are smallest aquatic hemiptera. Its body is strongly arched.

Since macro-invertebrates are pollution indicators, Insects are divided into three class depending upon the degree of pollution. In the present investigation the chironomous larva, Notonecta, Ephydra, Syrphidium larva, simulium and ceratopogon larva were grouped as class III, i.e. present in polluted water, similar was repted by (Das 1989 and Gaufin 1974). Entomo fauna including - caddisfly larva, Mayfly nymph of dragon fly and damsel fly, Dineutus, Gyrinus, Nepa, Corixa, Belosomatidae, Heleidae, Ranantra are grouped under class II, i.e. where water was moderately polluted. Similar was reported by (David and Ray 1966, Gaufin 1974, Das 1989 and Prasad and Vanshney, 1990).

Thus, Daha river is a unique river, shows richness in entomofaunal diversity. The main aim of this research is to study the entomofaunal diversity and steps taken to protect it.

Acknowledgements

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Synthesis, Characterization and Applications of Ferrite Nanoparticles by Bottom up Approach

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Ferrites

Ferrites are mixed metal oxides with iron in oxidation state of +3 as the main component. Electrically, they are bad conductors and display magnetic properties. The most common ferrites have the general formulae MFe_2O_4 and $MFe_{12}O_{19}$, where M stands for a divalent metal such as Nickel(Ni), Cobalt(Co) etc. Ferrites have been receiving growing attention because of their various commercial and technological applications(1,2). Spinel and magnetoplumbite ferrites are very important and exhibit ferrimagnetism. Their hysteresis loop is almost rectangular(3). For this reason, they are used in high frequency circuits as a magnetic cores and in switching devices.

Nanoparticles

Nanoparticles are particles in the range of size 1nm to 100 nm. To understand the properties, behavior and structure of particles in this scale is Nanoscience. Nanotechnology is application of nanoscience in development of newer tools. There are two facets, one is the development of devices of very small sizes and the other is the improvement of existing materials by reduction of sizes. The size reduction increases the surface to volume ratio, free energy content, band-gap, as well as defect concentration(4). This way, nanomaterials acquire some exotic properties which are not available in Bulk materials. Quantum confinement and surface effect plays an important role in modifying the properties of nanomaterials. Because of the extremely small particle size, the continuum energy bands become quantized into discrete energy levels. Due to these reasons, the structural, electronic, magnetic and optical properties that we observe in bulk size get modified in nano size(5), which depend on size, shape, composition and method of preparation. As for examples Chalk and seashell are made of same materials, calcium carbonate. Chalk is soft while seashell is hard. This is because the shells made of nanostructured materials.

In the **Nanocrystalline phase**, ferrites exhibited properties that are notably different from their bulk phase properties and strongly dependent on the conditions and preparation techniques (6,7). In this

phase the special emergence properties such as superparamagnetism, collective magnetic excitations, spin canting is to be found.

Growth of ferrite nanoparticles

There are several routes for preparation of nanocrystalline ferrite samples. One method that has been used widely is by powdering. Ball milling are normally employed for this. Fine powders have also been obtained using chemical precipitation and annealing. Electrolytic techniques have also been used. Several other methods exists besides these. A review of the different preparation techniques has been given by M.Pal and D.Chakravorty(8). Each of these techniques has its own advantage and disadvantage. The chemical route has a number of attractive features like simplicity and low cost of preparation so that it become an attractive for preparation of nanocrystalline phase ferrite. In chemical based citrate precursor method, generally nitrates of divalent metal, Iron and citric acid are taken in stoichiometric proportions and dissolve in minimal amount of distilled water. The aqueous solutions are mixed together and stirred at 60°C to 80°C temperature for two hours. A Brown slurry is formed, which is then dried in an oven at a temperature of 90°C. This dried materials is the citrate precursor(Figure 01). Ferrite nanomaterials are produced by annealing of the dehydrated precursor at predetermined temperatures in a temperature controlled muffle furnace.

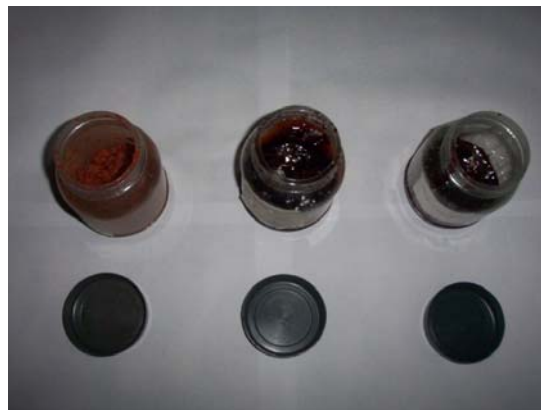


Figure no. 01: Citrate Precursor

Characterization:

The ferrite nanoparticles are characterized after their preparation using various characterizing tools, such as X-ray diffraction(XRD), Vibrating sample magnetometer(VSM), Transmission electron microscopy(TEM), Mossbaur spectroscopy, Scanning electron microscopy(SEM), Positron annihilation spectroscopy, Superconducting quantum interface devices(SQUID), and UV-VIS spectroscopy etc. The mean particle size, shape and phases are determined using X-ray diffraction method. Magnetic properties were measured using SQUID and VSM. TEM gives information about particle size distribution while SEM gives particle morphology. Mossbaur spectroscopy gives information about percentage of iron content and superparamagnetic behavior. Positron annihilation spectroscopy is a powerful experimental tool for probing the electronic and defect structure of solids(9).

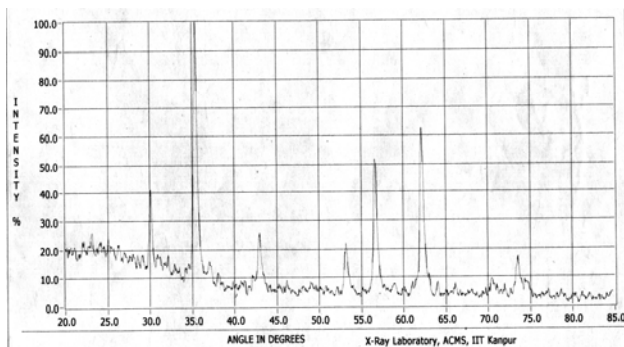


Figure no. 2: X- ray diffraction pattern of Zn Ferrite nanoparticle Annealed at 450°C (9)

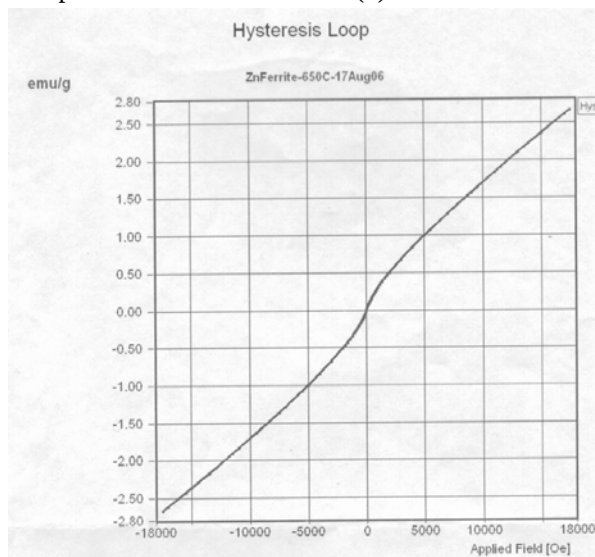


Figure no. 3: Hysteresis curve for Zn Ferrite nanoparticles (9)

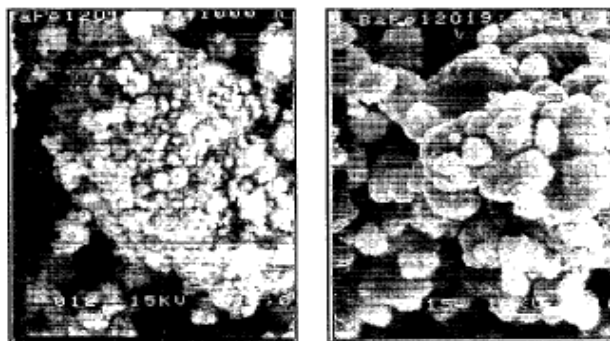


Figure no. 4: SEM Image Of Ferrite Nanoparticles (10)

For example we take zinc ferrite (10). The average particle size of Zinc ferrite sample was determined as 11.37nm using Scherrer equation ($d = \frac{k\lambda}{\beta \cos\theta}$) at 450°C and 33 nm at 650°C. Where k is constant that has value 0.9 and B is full width at half maximum. For this analysis, we used the most prominent peak(Figure 02).. The average coercive field and saturation magnetization of the this nanoparticle are 2.87Oe and 3.99 emu/g. The retentivity is 1.152×10^{-3} emu/g. We find average particle size increases as annealing temperature increased. Also the magnetic parameters value changes with particle size.

Technological applications for ferrite nanoparticles.

Ferrites have a broad range of applications in many disciplines. These include products and applications such as transformer cores for power applications.^{11,12,13} Multilayer ferrite chip inductors¹⁴, Microwave ferrite devices^{15,16}, ferrite wave absorbers¹⁷, Magnetic recording media¹⁸, ferrite magnets¹⁹, etc. In the field of medical sciences also, ferrites are finding numerous applications. Magnetic nanoparticles have unique magnetic features that can be applied to specific medical techniques²⁰. These include separation, immunoassay, magnetic resonance imaging, and many others.

Drug delivery and hyperthermia are enhanced by use of appropriate magnetic particles. Magnetic cationic liposomes (MLCs) can be used as carriers for introducing DNA into cells and heat mediators for cancer therapy.

There are other applications related to biological sciences. Applications include immobilization and modification of biologically active compounds by magnetic carriers, isolation of biologically active compounds, detection of biologically active compounds and xenobiotics, modification, detection, isolation and study of cells and cells organelles can all be effectively carried out with the help of magnetic nanoparticles.^{21,22}



Ferrites and ferrites based composite materials have wide applicability in the fields of integrated electronics, microwave devices, sensors and transducers, magnetic cores, electromagnets, magnetic storage devices.

We have not come to the stage where we can suggest new technological applications. But possibility of such leads in future cannot be ignored. We will have to continue with this exploratory work.

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Pollen-Pistil Interaction and Self Incompatibility Test in Safflower (*Carthamus tinctorius* Linn.)

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Abstract

Safflower is basically self-pollinating crop. However, cross pollination increases the number of seed setting. If anther dehiscence occurs before style elongates, the stigma pushes through mass of pollen, becomes coated with pollen and gets self fertilized. If anther dehiscence occurs after style elongates, stigma passes through the anther tube without becoming pollen coated, then cross pollination is needed. Absence of pollinators results in self-pollination. Anthesis of disc florets takes place between 06:30 h to 08:00 h. The number of pollen grains produced in safflower per anther/per flower is comparatively low (236 ± 74 grains/anther or 906 ± 372 grains/flower). In safflower highest seed set (%) was obtained with stigma pollinated 24h after anthesis. Stigma remains receptive up to 32-56 hours after anthesis. There is about 85.99% seed setting in the open pollinated heads followed by 38.15% (in muslin cloth) and 35.54% (in butter paper) of the flowers set seeds under bagged condition. Polyacrylamide gel electrophoresis shows that, 3 Protein bands (RP 0.21, 0.30 and 0.42) are present in both pollen and stigma. The percentage similarity is just 50%; indicating 50% chances for compatibility.

Key Words: Safflower, *Carthamus tinctorius*, Self incompatibility, PAGE.

Introduction

Safflower (*Carthamus tinctorius* L.) an important oil seed crop belonging to the tribe Cardueae of the family Asteraceae. The seeds yield creamish, edible, semi-drying oil which is used for culinary purposes, for anointing the body, as an illuminant, for soap manufacture and in paints. Seeds are also used for feeding the cage birds. The press cake is used for livestock feed and as manure (Anonymous, 1976; Li and Mundel, 1996). The crop is predominantly cultivated in Spain across North Africa and West Asia to India, many being indigenous to the Mediterranean region. Presently, safflower is cultivated in USA, Mexico, Ethiopia, Australia, Argentina, Russia, China, India, Egypt, Italy, Germany and Spain. Safflower producing States in India are: Karnataka, Madhya Pradesh, Maharashtra, Andhra Pradesh, Orissa and

Bihar. India is largest producer of safflower in the world. Attempts are being made to improve the crop by conventional breeding techniques as well as by using biotechnological methods.

Safflower is predominantly a self-pollinating crop, with the genetic potential of over 90% for selfing, although environmental conditions may result in outcrossing exceeding 50% (Li & Mundel 1996). Heterogeneity builds up quickly in safflower populations. To enhance their genetic homogeneity, plants selected as parents for genetic studies and breeding purpose are selfed by covering the flower for one or two successive generation with cloth or paper bags. To ensure planned crossing, flowers are emasculated by removing the anther tubes, along with the upper portion of the corolla and petal lobes, in the late bud stage (Knowles 1980). The next day, when the styles have elongated, the emasculated florets are fertilized with pollen from preselected flowers or head. However, a mass-emasculature technique (Deshmuk & Ranga Rao 1989), takes less time than emasculation of individual florets and allows more efficient production of crossed seeds.

Materials and methods

At 50% flowering stage, flowering branches of different plants with young unopened heads were bagged. When seed setting was completed and heads started drying, seeds were counted from both bagged and opened heads. Initially seeds from three different districts of Bihar viz. two area of Bhagalpur districts (Mohanpur diara, Bikramshila) and one area of Khagaria district (Parbatta), were cultivated following completely randomized design (CRD) with four replicates for each (Figure 1). However as no marked difference was noticed in their characteristics, data for seed setting from different plots was pooled. The data presented is an average of 90 heads for both bagged and open inflorescences.

The Polyacrylamide Gel Electrophoresis technique involves the co-polymerization of acrylamide ($\text{CH}_2(\text{NHCOCH}=\text{CH}_2)$) with a suitable quantity of cross linking compound N-N methylene Bis-acrylamide ($\text{CH}_2(\text{NHCOCH}=\text{CH}_2)$) with a suitable

free radical catalyst. Tetra Methylene Diamine (TEMED) was added to control polymerization. Riboflavine or Ammonium persulphate was used as a catalyst, which was freshly prepared in order to have better results. The porosity of gel was determined by the relative concentrations of acrylamide monomer and bis acrylamide (Davies, 1964). 200 mg pollen and pistil sample was crushed with 2 ml of 1 M phosphate buffer (pH- 6.2). After 24 hours it was centrifuged for the collection of supernatant. The collected supernatant was used for qualitative determination of protein. However, stepwise working protocol for qualitative determination of proteins is as follows:

(i) Run was carried out with a standard electrophoretic system and the gels were removed from the tubes with the help of 21 gauge needle by pushing water between gel and the glass tubes with the help of 21 gauge needle by pushing water between gel and the glass tube wall.

(ii) After this, these gels were treated separately for protein studies.

(iii) For studying proteins, gels were stained in 1.25% (w/V) coumassie blue in 7% glacial acetic acid for 25

minutes.

(iv) Gels were destained with 7% glacial acetic acid for atleast 24 h till visualization of sharp bands.

Results and Discussions

Safflower is basically self-pollinating crop. However, cross pollination increases the number of seed setting. If anther dehiscence occurs before style elongates, the stigma pushes through mass of pollen, becomes coated with pollen and gets self fertilized. If anther dehiscence occurs after style elongates, stigma passes through the anther tube without becoming pollen coated, then cross pollination is needed. Absence of pollinators results in self-pollination. Anthesis of disc florets takes place between 06:30 h to 08:00 h. The number of pollen grains produced in safflower per anther/per flower is comparatively low (236 ± 74 grains/anther or 906 ± 372 grains/flower). Observations were also made on the morphology of pollen and stigma. Open pollinated and bagged heads showed During present study bagging experiments reveal that there was about 85.99% seed

set in open heads while in bagged condition seed setting varied. It was 38.15% in muslin cloth, 35.54% in butter paper and 31.58% in news paper respectively (Table1).



Figure1. Self-incompatibility test in the field.

Table 1: Self incompatibility test in different experimental conditions

Types of Pollination	Total number of flowers	Number of filled seeds	Number of unfilled seeds	Percentage seed setting
Naturally pollinated heads	54.75 $\pm$ 7.70	47.083 $\pm$ 13.78	7.67 $\pm$ 6.07	85.99
Butter-paper bagged heads	54.76 $\pm$ 5.50	19.46 $\pm$ 8.88	35.3 $\pm$ 3.38	35.54
News-paper bagged heads	55 $\pm$ 6.05	17.37 $\pm$ 8.73	37.63 $\pm$ 2.68	31.58
Muslin-cloth bagged	51.53 $\pm$ 5.35	19.66 $\pm$ 4.67	31.87 $\pm$ 0.68	38.15

In the present study Polyacrylamide (PAGE) was employed for separation of protein in safflower. For analysis of proteins, pollen and pistil were selected. During electrophoretic separations of the proteins, five bands were observed in the pistil of safflower followed by pollen of safflower with four bands. Based on the present study it is concluded that protein is an important parameter for separating species. Three Protein bands were approximately matched to each other but one of them two extra bands present in stigma of safflower while, one band of pollen of safflower. Therefore from these observations, I conclude that protein bands show that the plant is self-compatible and in this plant protein doesn't work as barrier. R.P.Value and zymograms of *Carthamus tinctorius* L. showed in table 2. Proteins 1 & 5 (RP 0.13 PP 0.46) were noted to be specific for stigma while Protein 6 (RP 0.6) for pollens. 3 Protein bands (RP 0.21, 0.30 and 0.42) was present in both pollen and stigma. The percentage similarity is just 50%; indicating 50% change for crossability / compatibility.



Protein	CP	CS
P1	0.6	0.46
P2	0.42	0.4
P3	0.33	0.29
P4	0.21	0.22
P5		0.13

RP	CP	CS
0.13	-	+
0.21	+	+
0.30	+	+
0.42	+	+
0.46	-	+
0.6	+	-

Table2. (a) R.P. Value of protein in Pollen grains and pistil of safflower.

(b) R.P Value of Pollen grains of safflower and pistil showing presence and absence of protein bands.

Flower in safflower are borne on a capitulum which consists of single types of flower. The disc florets are hermaphrodite where as ray florets are absent. Pollen grains are spherical, and yellow. They are tricolpate, triporate, with irregularly circular pores and short germinal furrow which is broad in the center. The echinulate exine has spines with circular base and sharp pointed vertical projections. Upper surface of stigma shows numerous papillae covered with uniformly thickened cuticle overlaid with a layer of pallicle. The stigma is of dry type. A floret opens and liberates early in the morning, the style emerges about mid day and the stigma lobes separate and curl backwards in the evening. Unlike other Cardueae members, the stigma lobes in safflower rarely curl sufficiently to touch the pollen in their own style (Weiss, 1983), a circumstance which also helps to explain failure of this plant to set seeds readily under bagged conditions. Earlier, Knowles (1958) studied the influence of insects in seed setting in this plant where plants were allowed to flower in cages from which bees were either introduced or excluded. Plants visited by bees had 45 seeds per head while those without bees set only 16 seeds per head. Formation of seeds under

bagged conditions shows that there is some selfing in this crop. Seed setting under muslin bags has been reported to take place only if the weather is fair, particularly if the sky is not cloudy and there is low humidity in the air (Chavan, 1961). It shows that temperature and humidity influence compatibility behaviour of safflower.

Safflower is homomorphic and of sporophytic type. Our observations have shown that in incompatible pollination, pollen germination was usually inhibited on the stigma surface. If pollen grains germinate somehow their tubes twist over the surface of the papillae and do not penetrate the basal portion. Detailed studies on this aspect is in progress and will appear in progress and will appear elsewhere.

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Toxic Effect of Ganga pollution on fishes in Bhagalpur

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Abstract

The present study is an attempt to understand the “toxic effect” of Ganga on fishes. Fishes are the first vertebrate animals. Fish out of water, is an extremely uncomfortable creature and in a few moments displays miserable agonies of death. A vast number of people are engaged in the business of fishes & fisheries. The Government of India and the state Government should co-ordinate and co-operate to ensure the life risk coverage of the people. The important things we noticed during our project work was water pollution, Small fishes being killed illegally, Low literacy role among children, Security of Dolphin & other foreign birds are in danger in this zone. In aquatic ecosystem small fishes from the secondary consumers. The killing of these fishes will affect the aquatic ecosystem, which in turn affect environment. Water is essential for all living organism. Due to nitrogenous fertilizers, which go to drinking water and become toxic when their concentration exceeds 90 ppm causes diarrhoea. There are some other metallic contaminants such as Cd, Ni, Cr, Ar, Antimony, Hg, Cu & Zn whose accumulations in body tissues could produce illness. Many forms of aquatic life have been greatly affected in this way.

Keywords: Ganga, Toxicity, fishes

Introduction

The Ganges Basin drains an area of approximately 814,400 km², spans three countries, India, Nepal and Bangladesh and is occupied by around 200 million people. This project was directed towards an investigation of the basin-wide condition of the fisheries and the problems of their management in the context of the conditions prevailing in the basin as a whole. Integrated management of resources within river basins as a whole will ultimately be the only way forward, as pressure on resources increases. Most existing information on the Ganges has been carried out on a country basis. This has been assembled for the three constituent countries as a separate review document (Temple and Payne 1995), to facilitate understanding within the basin as a whole.

India coast has been divided into the biogeographical zone to study the distribution and bionomics of marine fishes inhabiting Indian waters and to assess the topographic conditions for the establishment of fisheries. Indian coast has been divided into 12 zones:

1. W.B. and Orissa
2. Andhra coast (Gopalpur –Visakhapatnam)
3. Andhra coast (Visakhapatnam-Masulipatnam-)
4. Andhra coast (Masulipatnam-pulikat lakes)
5. Coromandel coast (Pulikat lake to Cuddalore)
6. Coromandel coast (Cuddalore-Devipatnam)
7. Palk Bay and Gulf of Mannar (Devipuram-Cape Connorin)
8. Kerala and South Malabar (Cape Connorin to Ponnani river)
9. Malabar and South Kanara (Ponnai river to Mangalore)
10. Konkan coast (Mangalore to Ratangiri)
11. Bombay and Gujarat coast (Ratangiri to Brach)
12. Kathiwar coast

About 66% of fishes are obtained from the sea. About 50% of the total products are sun-dried, salted or pickled for future consumption. A good part of the landings in different parts of the country gets spoiled due to lack of adequate transport and preservation facilities.

There are two main types of tributaries in the upland zone, snow-fed and spring-fed rivers. The snow-fed are typically cold and silt laden, whilst the spring-fed tend to be clear, slightly warmer and to exist at rather lower altitudes. The main stem of the Ganges in the upland zone is snow-fed and typified by the heavy grey/white silt load coming down from a relatively recent mountain block, the Himalayas. There is a seasonal pattern to transparency. The river is clearest and turquoise in colour, due to refraction of mica flecks, during the winter, but as snow-melt begins in the montane glacier zone, the grey silt load increases through May becoming most intense during the rains, and can be maintained until early winter. The other main stem tributaries which arise at similar altitudes, the Trisuli and the Sun Kosi, are similar. Annual temperature variation of upland snow-fed rivers below 600 m ranged from 15°C to 18.7°C and even at the transitional zones at Haridwar and Naryanghat, rarely



exceeded 20.5°C and never went beyond 21°C. This temperature is probably very significant in the division of upland from lowland fisheries since it coincides with the tolerance limits of snow trout (see below). Spring-fed rivers may be warmer: for example, the Seti in the Gandak system had a temperature of 20°C to 22°C when the snow-fed Trisuli, which it joined, had a temperature of 15.8°C. The difference between snow-fed and spring-fed rivers is of great significance for the fisheries.

Once the river reaches beyond the transitional zone it becomes broad and meandering, although mainly between well defined banks. Exceptions are the northern tributaries, where seasonal overtopping gives expansive and occasional catastrophic flooding, such as can occur particularly in the North Bihar wetlands around the Gandaki. The water is generally warm and silt laden. Extreme river temperatures at Patna ranged from 18.6°C to 33°C, with a distinct seasonal cycle. Hydrographs also follow the seasonal rains pattern with a seasonal increase in depth of 3.5 m in the Ganges and 13.5 m in the Yamuna between dry season and the peak of the flood in August. Other limnological factors tended to follow this cycle. The dissolved mineral content of the Ganges water is relatively high with an essentially alkaline pH (8.08 to 8.7). Conductivity ranged from 164 to 362 μ S and total dissolved solids (TDS) 87 to 179 mg l⁻¹. This is high compared to many tropical and sub-tropical river systems. A linear predictive relationship was found between the more conveniently measured conductivity and the more meaningful TDS.

The social and economic structure of the fisheries is strongly influenced by culture, faith and tradition within the basin. The strong trend towards vegetarianism in the Hindu faith means that local markets for fish throughout the basin in India and Nepal are patchy, although restrictions in the upland regions are less marked. By contrast, the people of Bengal in the delta, both east Bengal (Bangladesh) and West Bengal (India), are renowned eaters of fish and Calcutta provides an insatiable market. The existence of Calcutta and the few other urban centres, combined with the relative lack of local and peripheral demand, serves to centralise the fish landing and distribution systems, at least in India. In Bengal, by contrast, demand is widespread and markets are much more diffuse. There are also considerable social restrictions as to who should participate in the fishery. Within India only sub-groups of category 4 caste can traditionally do fishing and this still largely holds. The same is also true in Nepal although divisions are less distinct. In Bangladesh the Muslim majority

traditionally do not fish and leave this activity to sectors of the residual Hindu population. This, however, is changing as population pressure increases on the land and more people, including Muslims, are forced into fishing as a last resort.

To an unusual extent, therefore, socio-religious pressures influence access to and participation in the fishery. The free-for-all open access to common property resources seen in other regions need not be the case in the Ganges Basin. The concern with the upland, cold water fisheries as largely being for sport purposes, has distracted attention from the robust artisanal fishery which exists in the upland region. In the upland regions of both India and Nepal, wherever markets exist fishing goes on. Markets depend upon local centres of population or where roads cross or run alongside rivers. The torrential nature of most rivers in the upland region makes fishing very difficult and has led to considerable ingenuity in developing fishing methods. A particularly effective device used in the upland areas of the Ganges in India and also in some rivers in Nepal, such as the Sun Kosi, is the mountain gill net or "paso". This is a longline to which are attached not hooks, but monofilament traces each ending in a noose tied with a slipknot. These nooses are placed on the line at intervals of a metre. The fish swim into the nooses, which automatically tighten around them. This and the cast net are probably the commonest gears. Dynamite, however, is also frequently used, both in India and Nepal, and is particularly damaging and wasteful. It is a practice, which must be stopped.

Classification

The fishes are under the branch Gnathostomata meaning "mouth with jaws". All fishes have gills in the adult stage. Fishes are divided into four classes –

- (1) Elasmobranchii
- (2) Holocephali
- (3) Teleostomi
- (4) Dipnoi

Last two classes include almost all the fresh water genera.

The production of fish in India is very low in comparison to other countries.

B. FISHING APPLIANCES (Net):

- Big net (maha jal)
- Bag nets (conical and without wing)
- Dol-A bag net of bombay



Dip net

Drift net-provided with sinkers & floats

Stringed cast net

Launching net

Drag net for channa

Been net of Bihar for C.mrigala

Khalpatta net of sunderbans for Anabas

Stake net- (high tides)

Purse net (hand net) of Bihar

Cast net (In the combination of stake net & Rangoon nets)

Wall net

Mani jal

Ber jal & Jagat ber jal

Sahelo jalo, Patna jalo

Moi jal, Shanglo jal

Karal or catla jal (Drift net)

Kochai jal, chhandi jal

AUNTA: It is a fishing craft made of nylon net and bamboo stick. It looks like cylindrical in shape. Internally, it is made of bahi, deep nets, bandhan.

Fishes collide with bahi to enter the net. Fishermen open the mouth of the net and collect the fishes. This type of fishing net is left in water for 24 hours. The collection of fish by this process is 1 K.g to 2 K.g in unfavourable condition.

TAPI: A small craft looks like large cap and conical in shape. Its perimeter is loaded with stone, which made the lower end in contacts with ground during the fishing period. At the time of fishing this net has been taken into the hand then the net is thrown away over water. It is a very easy means of catching fishes.

HOOKS AND BANSHI: A bamboo stick with attached rope (thread) and hook used to catch fish. Generally, eastern pieces or flour is introduced a frod of fishes. The hook is fixed by the string to a strong bamboo stick. It is an easy craft & gear to catch fish.

EGG COLLECTION NET: It is used to collect eggs during rainy season. It is a special type of craft & Gear meant for the collection of eggs of fishes, small in size.

FISHING NET: Fishing net is in rectangular shape. One side it has numerous floats made up of very light log or plastics hollow box or lighter objects. This net is generally used when the water level is generally high.

DEMERITS: -

- Lack of adequate transport and preservation facilities.
- Topographic conditions.
- In marketing Managements & trade facilities.

- Non-availability of developed & modern fishing techniques.
- Lack of Preservation & storage facilities.
- Lack of Trawlers & Power vessel.

MERITS: -

- Employment opportunities for poor fishermen, salesmen, businessmen.
- Rich resources of Proteineous food.
- Cold livers of several fishes yield oil rich in Vit. A & D. Body oils are used in tannin, soap making & tempering steel.

The interest in fish and fishery in India can be seen from the paintings of fishes on earthen vessels of ancient Indian history. Fish culture has great importance to human beings since long. Fish is a good source of proteins. These days, protein deficiency is the world's most serious problem and about 40 to 90% of the world population is suffering from protein deficiency. In India, the intake of meat and milk is low, so fish has special importance as a supplement to ill balanced cereal diets. In India, inland water with potentialities of fish culture is approximately 7.5 million hectares or 2.34% of the total area of the country. Many of the water resources remain either unused or not properly used for fish culture. In recent years, research conducted by the Central Inland fisheries Research Institutes have revolutionized fish culture in India and a net production of 8500 Kg./hectare/year has already been achieved.

The social and economic condition of the fishermen is very miserable. They live at hand to mouth. Most of them are below poverty line. They are unable to send their children school. They do not have proper shelter.

Most of the time the economic conditions of fishermen in India is not good. They are happy only in rainy season (July to August). During this period, water level remains high and fish productions are generally satisfactorily. For the rest of the period of year, the fish production level is low due to low level of water.

Conclusions

Fishes are the first vertebrate animals, which adapted to live through out their life in water. Therefore, proverbially "fish out of water" is an extremely uncomfortable creature and in a few moments displays miserable agonies of death. Fishes have streamlined shape. The skin of fishes are covered with scales in different fashion e.g. smooth, rough, horny, tooth like e.t.c. They have limbs represented by fins. The different colours of fishes are due to presence



chromatophores, which contain pigments. A vast number of people are engaged in the business of fishes & fisheries. The Government of India and the state Government should co-ordinate and co-operate to ensure the life risk coverage of the people.

The important things we noticed during our project work was:-

- (1). Water pollution
- (2). Small fishes being killed illegally.
- (3). Low literacy role among children.
- (4). Security of Dolphin & other foreign birds are in danger in this zone.

In aquatic ecosystem small fishes from the secondary consumers. The killing of these fishes will affect the aquatic ecosystem, which in turn affect environment. Water is essential for all living organism. Due to nitrogenous fertilizers, which go to drinking water and become toxic when their concentration exceeds 90 ppm causes diarrhoea.

There are some other metallic contaminates such as Cd, Ni, Cr, Ar, Antimony, Hg, Cu & Zn whose accumulations in body tissues could produces illness. Many forms of aquatic life have been greatly affected in this way.

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Seed Germination Studies in *Rauvolfia serpentina*

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Abstract

Seed germination studies in *Rauvolfia serpentina* have shown seedcoat dormancy. Unscarified seeds do not germinate at all while scarified seeds exhibit 54% germination. Attempts of scarification by conc. H_2SO_4 proved futile. There was reduction in germination at higher moisture and salt stress created by NaCl and Na_2SO_4 . In $MgSO_4$, the germination potential was 82.7% at lower concentration as against declining trend at higher concentrations. Unscarified seeds did not germinate at any concentration of IAA as against scarified seeds which showed 95.2% germination at 10ppm and 90.4% at 100ppm. Higher percentage of germination was also achieved in response to Gibberellic acid and Cytokinin at moderate and higher concentrations.

Key Words : Germination, *Rauvolfia serpentina*

Introduction

Rauvolfia serpentina (L.) Benth.ex kurz (Apocynaceae) is a well known medicinal plant against hypertension as sedative or tranquilizing agent. It is commonly called as **Sarpgandha** and is widely distributed in sub-Himalayan tract. The plant is an erect evergreen perennating undershrub. Flowers are white with pinkish tube in terminal peduncled bright red cymes. Seeds are polished green in young stages and purplish black at maturity.

Despite their wide geographical distribution and edaphic tolerance, *Rauvolfia serpentina* is not easily cultivated due to limited supply from wild sources, laborious collection of seeds and poor percentage of seed germination. Sometimes, there is no embryos in fruits of perfectly normal phenotypic appearance. It has been observed that optimum yield of roots (parts used for alkaloids) is obtained when plants are propagated by seeds. Thus, it is essential to study germination potential of this species in varying environmental regimes.

Material and Methods

The material for present investigation is *Rauvolfia*

serpentina. It is source of a drug reserpine used in treating blood pressure and insanity.

The seeds are dormant and suffer from seedcoat dormancy. To study germination, seeds were mechanically scarified with blade and half coats were removed. Care was taken to protect the embryonal portion.

Germination was achieved after treating the seeds with 0.1% $HgCl_2$ and put on moist filter paper backed with cottonwool in Petridishes. Distilled water was used for moistening. The temperature was kept at 35°C. In moisture stress experiments, artificial stress was created by increasing the number of filter papers keeping the amount of water constant (Sinha *et al.*, 1991). IAA, GA_3 and Cytokinins were used in 10, 25, 50 and 100 ppm concentrations.

Observation

In control, the germination potential is zero in unscarified as against 54% in scarified seeds.

• Effect of scarification by conc. H_2SO_4 :

Seeds were scarified with conc. H_2SO_4 for 2 minutes to 20 minutes. They were washed thoroughly in running water for an hour to remove traces of H_2SO_4 . Seeds thus, washed were kept for germination. Seeds treated with conc. H_2SO_4 did not germinate at all.

• Effect of Moisture Stress :

Seeds showed 54% germination in regime I which acted as control. There was 33.3% germination in regimes II and III. (Table 1)

• Effect of Salt Stress :

At lower concentration of NaCl i.e. at 0.5%, the seeds showed 28% germination but at moderate concentration, the germination decreased. At 2-3.5%, the seeds did not germinate. (Table 2)

In Na_2SO_4 , the germination percentage is 28-56.7% at 0.5% concentration. The rate of germination decreased and became nil at higher concentrations.

In $MgSO_4$, the germination potential was 82.7% at lower concentration as against declining trend at higher concentrations.

• Effect of IAA :

Unscarified seeds did not germinate at any



concentration of IAA. Scarified seeds showed 95.2% germination at 10 ppm and 90.4% at 100 ppm. (Table 3)

- **Effect of Gibberellic Acid :**

Rate of germination varied from 51 to 77.4% at varying concentrations. At 100 ppm the germination was maximum i.e. 77.4%. (Table 3)

- **Effect of Cytokinin :**

At moderate and higher concentrations, the germination potential was 95.2%. The lower concentration (10 ppm) showed 90.4% germination. (Table 3)

Discussion

On perusal of the results, it appears that *R. serpentina* has an extremely hard seedcoat. Conc. Sulphuric acid treatment failed in making the coat permeable. Seeds having half coat removed by blade proves that dormancy is due to hard seedcoat which prevents the germination of seeds and may be an ecological adaptation (Jain *et al*, 2006). Seed coat puncturing has been tried in *Sida* spp. with favourable results (Lissy & Simon, 2007).

Seeds in response to moisture stress established that availability of water is directly proportional to seed germination. In regime I where water was optimum, the germination potential was 54%. The germination declined in increased moisture stress. Khadeer *et al.* (1987) explained the arrest of synthetic activity at high stress due to increased activity of oxidase and hydrolysing enzymes. Agarwal *et al* (1999) have reviewed certain aspects of water stress induced changes and tolerance mechanism in plants. They concluded that solute accumulation, ascorbic acid composition and stimulated functioning photosynthesis are physiologically affected under water stress conditions.

The availability of water for imbibition depends to a large extent on the composition of the medium in which germination takes place. As the concentration of salts in the medium increases, the availability of water for imbibition decreases due to osmotic effects. Kalita and Bhattacharya (1993) studied effect of phenol on germination and NaCl on germination and seedling growth of pea. They observed reduced length of main root with 4 hrs. soaking period. Almost all concentrations showed reduced length of main root. Length was reduced to 3 cm at 50 ppm concentration. They explained it due to changes of certain metabolic processes. The enhanced germination at low concentration (0.5%) of $MgSO_4$ might be due to utilisation of Mg for synthesis of various storage magnesium salt. Magnesium in plants is mainly related to its capacity to interact with strongly nucleophilic

ligands through ionic bonding and to act as a bridging element or form complexes of different stabilities (Marschner, 1995). It may be safely concluded that soils having low sulphate are suitable for better germination potential of *Rauvolfia serpentina*. Joshi and Khairatkar 1995 studied seed germination, amino acids and sugars in seedlings of *Juncus* spp under salt stress. They reported adverse accumulation of total and reducing sugars and that of glucose, galactose and arabinose in both the species. There was greater concentrations of asparagines, aspartic acid, phenylalanine and of some other aminoacids including proline in seedlings in saline habitat. These amino acids have protective effects on cell membranes in seedling in halophytes.

Germination is greatly influenced by endogenous and exogenous growth hormones. Unscarified seeds did not germinate at any concentrations of IAA while scarified seeds germinated upto 95.2% at 10 ppm of IAA and moderate and higher concentrations of cytokinin. At 100 ppm of IAA, the germination was 90.4%. Lower concentration of cytokinin was also promotive. In GA_3 treatment, the germination varied from 51 to 77.4%. Effect of different physical and hormonal treatments on the release of dormancy shows that compared to physical treatment, hormonal treatments were more effective in *Withania somnifera*, (L.) Dunal by Kumar *et al* (2001).

It appears that plant hormones affect nucleic acid directed protein synthesis, enzyme activity and membrane permeability either directly or through some other metabolites. The molecular aspects include activation of gene expression and sticking to the lipid components of the membranes and altering the membrane permeability (Srivastava, 2005). The promotive but lesser percentage of germination in *Rauvolfia serpentina* after GA_3 treatment is due to keeping the seeds at 35°C for germination. According to Srivastava (2005), GA_3 promotes seed germination in several spp which otherwise fail to germinate unless subjected to low temperature, long days or red light. Overall seed germination in *Rauvolfia serpentina* is low. Very poor germination of seeds on filter paper may be ascribed, apart from other factors including deficient food reserves, primarily to the seedcoat factor.

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Table – 1 : Effect of moisture stress

Moisture regimes	Initiation period (days)	Rate of germination per day (%)	% of Germination
Regime I	1	39.2	54.0
Regime II	1	28.6	33.3
Regime III	0	24.9	33.3
Regime IV	6	13.9	16.7
Regime V	2	5.6	5.6

Table – 2 : Effect of salt stress

Concentration of salt (in %)									
	NaCl	Na ₂ SO ₄	MgSO ₄	NaCl	Na ₂ SO ₄	MgSO ₄	NaCl	Na ₂ SO ₄	MgSO ₄
Control	1	1	1	39.2	39.2	39.2	54.0	54.0	54.0
0.5	1	2	1	18.2	43.3	49.7	28.0	56.7	47.9
1.0	1	2	1	9.1	18.3	35.4	12.0	40.0	82.7
2.0	—	—	1	—	—	27.9	—	—	43.6
3.0	—	—	2	—	—	12.3	—	—	21.8
3.5	—	—	4	—	—	8.6	—	—	13.0

Table – 3 : Effect of growth regulators on germination potential

Concentration of hormone (ppm)	Initiation period (days)						
		IAA	Gibberellic Acid	Cytokinin	IAA	Gibberellic Acid	Cytokinin
Control	1	39.2	39.2	39.2	54.0	54.0	54.0
10	1	73.7	54.2	72.5	95.2	73.1	90.4
25	1	60.1	42.5	76.8	76.0	51.6	95.2
50	1	71.9	45.2	71.9	85.7	60.2	90.4
100	1	69.5	54.8	82.7	90.4	77.4	95.2

Thermodynamic Properties and Alloying Behaviour of Liquid binary Alloy

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Abstract

The complex formation model first proposed by Bhatia and Hargrove [1] assumes the existence of chemical complexes or pseudomolecules in liquid binary alloys. On the basis of this concept Singh and his coworkers [2-5] have studied various thermodynamical properties of different binary alloys. We have also studied different alloys within this framework [6-8]. The present paper envisages the study of some thermodynamic properties viz., Gibbs free energy of mixing (G_M), Enthalpy of mixing (H_M) and Entropy of mixing (S_M) of the alloy under study. The results are in reasonable agreement with experiment and throw light on the ionic interactions of the constituent atoms leading to the alloying behaviour of the alloys under investigation.

Keywords: Disordered Systems; Electronic Transport; Thermodynamic Properties.

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1. Introduction

A study of the recent literature reveals that in comparison to alkali metals, lesser amount of work has been done on liquid alkaline earth metals and their alloys [1]. The alloy Al-Mg has been acknowledged to be a good glass former [2]. The linear decrease in the melting temperature and flattened minimum in the intermediate region led Pearson [3] to believe that intermetallic compound Al_3Mg_2 exists in the solid state. He has also suggested $Al_{12}Mg_{17}$ while Samson and Gordon [4] have found $Al_{30}Mg_{23}$. In addition to its glass forming nature the alloy is useful in the production and design of low cost light metallic alloy [5]. Faber [6] has also confirmed the formation of chemical complexes.

Recently we have carried out extensive and systematic studies on thermodynamic properties of Cu-Mg [7] and Ca-Mg [8] where the calculated data were compared with the available experimental results. In the present work, the thermodynamic study of Al-Mg is performed using the same formalism. The theoretical results have been compared with the experimental data

2. Thermodynamic Properties

The thermodynamic properties viz., Gibb's free energy of mixing (G_M), the heat of formation (H_M) and the entropy of mixing (S_M) have been computed through the Bhatia-Hargrove technique [9]. The binary alloy is assumed to consist of a pseudo binary mixture of $N_A = Nc$ and $N_B = N(1-c)$ g moles of A and B atoms, and a type of $A_\mu B_\nu$ of chemical complex. Here μ and ν are assumed to be small integers, c is the atomic fraction of A atoms and N is the Avogadro's number. Following the complex formation model [9], we assume that the complex Al_3Mg_2 exist in the binary system. The formalism as already presented in our previous papers [7, 8] for other binary systems may be summarized as under

$$G_M = -n_3 g + RT \sum_{i=1}^3 n_i (\ln n_i - \ln n) + \sum_{i < j} \sum \left(\frac{n_i n_j}{n} \right) W_{ij} \quad (1)$$

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where g is the formation energy of the complex and it follows that the first term in the equation represents the lowering of the free energy due to the formation of complexes in the alloy, n_3 is the number of complexes at equilibrium, W_{ij} 's are the interaction energies and by definition they are independent of composition although they may depend on temperature and pressure, R is the molar gas constant and n is the total number of atoms in the case of compound formation. Once the expression for G_M is obtained, other thermodynamic and microscopic functions, which are related to G_M through standard thermodynamic relation, follow readily as,

$$H_M = G_M - T \left(\frac{\partial G_M}{\partial T} \right)_{T,P,N} \quad (2)$$

$$S_M = (H_M - G_M) / T \quad (3)$$

The expression for the Gibb's free energy of mixing can then be used to provide an equation for the thermodynamic activity using the general relationship,

$$RT \ln a_A = \left(\frac{\partial G_M}{\partial N_A} \right)_{T,P,N_B} = \frac{1}{N} \left[G_M + (1-c) \left(\frac{\partial G_M}{\partial c} \right)_{T,P,N} \right] \quad (4)$$

The first thing to do is to fit the values for the parameters g and W_{ij} . In order to do this, we first calculate the value of g at the chemical concentration $c = \mu / (\mu + \nu)$ using as a starting point, $g \approx -(\mu + \nu) G_M$. The energy parameters W_{12} , W_{13} , W_{23} are then adjusted in order to reproduce as closely as possible, the experimentally measured concentration dependence of the Gibb's free energy of mixing. Once the energy parameters have been selected they remain the same for all mixing.

(i). **W_{ij} and G_M** : The result of the above computations has been presented in Fig.1 for inspection alongwith the experimental values of G_M from Hultgren et al. [10].

The interaction energies obtained through the fittings are $W_{12} = -0.60$, $W_{13} = 0.50$, $W_{23} = -0.50$ and $g = 1.50$ at 1073 K (in terms of RT). On experimental grounds a smaller value of $g < 3.5$ suggests that Al-Mg is a weakly interacting system in the light of formation energy g and it comes in the category of the Mg-Sn, Ag-Al and Cu-Sn systems, in contrast to the strongly interacting systems like Hg-Na, Hg-K, Tl-Te, Mg-Bi etc. for which the formation energies are much larger i.e., 8.294, 9.965, 10.84, 16.7 respectively.

Further, we observe that the interaction energies W_{12} and W_{23} are attractive while W_{13} is repulsive in nature. This also supports the weakly interacting nature of Al-Mg alloy. The free energy of mixing G_M shows a good agreement with experiment (Fig.1) and $G_M = -0.8890$ at the equiatomic composition also speaks of a weakly interacting system. Also we observe that G_M is symmetrical for Al-Mg while it is found to be asymmetric for alloys like Al-Ca, Ca-Mg, Mg-Zn and Cu-Mg etc. However n_3 is not maximum at the equiatomic composition $c_{Mg} = 0.5$ rather it is maximum near $c_{Mg} = 0.4$ which indicates the formation of complex Al_3Mg_2 .

(ii). **H_M and S_M** : A perusal of Fig.2 showing the heat of formation H_M and entropy of mixing S_M of Al-Mg alloy for various concentrations at 1073 K alongwith the experimental data of Hultgren et al. [10] brings out the fact that although the heat of mixing H_M is in fair agreement with experiment the entropy of mixing from $c_{Mg} = 0.3$ to 0.6 shows a departure predicting smaller values than the experimental ones.

3. Structure Factors

The experimental data of partial and total structure factors of binary alloys are not available at different compositions; also they have insufficient accuracy [11]. Thus one has to divulge into computational effort and this is achieved through the hard sphere reference system, obtaining the solutions of Percus-Yevik equation for m-component hard sphere mixture (Hiroike [12] and Hoshino [13]). The total structure factor $S(k)$ is given by

$$S(k) = c_1 S_{11}(k) + c_2 S_{22}(k) + c_3 S_{33}(k) + 2(c_1 c_2)^{1/2} S_{12}(k) + 2(c_1 c_3)^{1/2} S_{13}(k) + 2(c_2 c_3)^{1/2} S_{23}(k) \quad (5)$$

where, $S_{ij}(k)$ are the partial structure factors, $c_1 = n_1/n$, $c_2 = n_2/n$, $c_3 = n_3/n$ are the concentration fractions of the scattering centers A, B and $A_\mu B_\nu$ (the chemical complex). Here q is the wave vector and c_1 , c_2 , c_3 being the concentration fractions of the scattering centers A, B and $A_\mu B_\nu$ ($A = Ca$, $B = Mg$, $\mu = 1$, $\nu = 2$).

These computations need two ingredients viz., hard sphere diameters σ_i and packing fraction η related by

$$\eta = \pi(6\Omega)^{-1} \sum c_i \sigma_i^3 \quad (6)$$

c_i are the concentrations of the species and Ω is the volume of the alloy.

The hard sphere diameters σ_1 and σ_2 are calculated by matching the first peak of the structure factors of the constituent elements at their melting temperature. They have been assumed to be independent of temperature and concentration and σ_3 has been taken to be 0.11 nm for Al-Mg alloy. The number of complexes n_3 along with the above mentioned hard sphere diameters are used to compute the partial and total structure factors. The computed partial structure factors and the total structure factor at $c = 0.4$ and 0.5 have been shown in Fig.3 against $\eta = k / k_F$, k_F being the Fermi wave vector.

A perusal of Fig.3 bring out the following facts

- (i). $S_{33}(k)$ remains positive throughout the range of $\eta = k / k_F$.
- (ii). $S_{11}(k)$ and $S_{22}(k)$ are negligibly negative at $\eta = 0.4$ only and then they become positive.
- (iii). $S_{12}(k)$, $S_{13}(k)$ and $S_{23}(k)$ have both positive and negative values like $S_{11}(k)$ and $S_{22}(k)$.
- (iv). At equiatomic composition, $S_{22}(k)$ is higher than $S_{11}(k)$ and $S_{33}(k)$.

It should be mentioned that, the total structure factor $S(k)$ shows the behaviour of random mixing without a sub-peak or asymmetry of the first peak and shows the behavior of compound forming with a sub-peak below the first peak [14]. The partial structure factors of unlike atom pairs have maxima, which lies in between those of like pair of atoms in case of random mixing. On the other hand, in compound forming alloys the partial structure factor of unlike atom pairs have a very sharp peak with a sub-peak below the main peak. Various alloys also show their behavior in between these two types. Negative peak in the lower region of k / k_F indicates preference for unlike nearest neighbors. The humps in the lower k regions are due to short-range order (SRO) with preference for unlike nearest neighbors [15].

Positive values of partial structure factors imply that the repulsive core part of the effective interionic potential is dominating whereas the negative values imply that the dominating part is attractive in nature.

4. Concentration-Concentration Fluctuation, $S_{cc}(0)$

The stability and microscopic structures of binary alloys may be studied through the evaluation of Bhatia-Thornton partial structure factors for the long wavelength limit $q \rightarrow 0$. This has been termed as concentration-concentration structure factors $S_{cc}(q)$ related to Ashcroft-Langreth structure factors $S_{ij}(q)$ as

$$S_{cc}(q) = c_1 c_2 \left[c_2 S_{11}(q) + c_1 S_{22}(q) - 2(c_1 c_2)^{1/2} S_{12}(q) \right] \quad (7)$$

Singh and his coworkers [16, 17] have linked $S_{cc}(0)$ for $q \rightarrow 0$ to the chemical short range order (CSRO) parameter α through

$$(A, B)_{l,m,n} = c(1 - \alpha_{l,m,n}) \quad (8)$$

where l, m, n are the coordinates of the nearest neighbor of atom A or B. $(A, B)_{l,m,n}$ denotes the probability of finding A atom at the atomic site l, m, n as a nearest neighbor of a given B atom.

The ideal value $S_{cc}^{id}(0)$ is given by,

$$S_{cc}^{id}(0) = c(1 - c) = c_1 c_2 \quad (9)$$

and the actual $S_{cc}(0)$ is given by complex formation model as

$$S_{cc}(0) = \left[\sum_{i=1}^3 \frac{n_i'^2}{n_i} - \frac{n'^2}{n} + \left(\frac{2n}{RT} \right) \sum_{i < j} \left(\frac{n_i}{n} \right)' \left(\frac{n_j}{n} \right)' \frac{W_{ij}}{n^2} \right]^{-1} \quad (10)$$

where a prime denotes differentiation with respect to c_1 . On the other hand, $S_{cc}(0)$ computed through the experimental Gibb's free energy of mixing are termed as experimental $S_{cc}(0)$, obtained through

$$S_{cc}(0) = NK_B T \left(\frac{\partial^2 G_M}{\partial c^2} \right)_{T,P,N}^{-1} = (1-c) a_A \left(\frac{\partial a_A}{\partial c} \right)_{T,P,N}^{-1} = c a_B \left[\frac{\partial a_B}{\partial (1-c)} \right]_{T,P,N}^{-1} \quad (11)$$

where,

$$a_A = a_0 + a_1 c + a_2 c^2 + \dots + a_{10} c^{10} \quad (12)$$

$$a_B = b_0 + b_1 c + b_2 c^2 + \dots + b_{10} c^{10} \quad (13)$$

At temperature above Debye temperature and in the long wavelength limit $S_{cc}(0)$ represents the mean square thermal fluctuations in the particle. The long wavelength limit ($S_{cc}(0)$) of the concentration-concentration structure factor [18] is of considerable importance [19, 20] to study the nature of atomic order in binary liquid alloys. The basic advantage of $S_{cc}(0)$ is that one can determine it making use of the thermodynamic relations.

The last two equalities of Eqn. (11) can be used directly to compute $S_{cc}(0)$ from observed numerical data. This is usually known as experimental values of $S_{cc}(0)$. It is possible to use the variation of $S_{cc}(0)$ with concentration to understand the nature of atomic order in liquid alloys. Basically, the deviation of this quantity from its ideal values given by $S_{cc}^{id}(0) = c_1 c_2$ is significant in explaining the interaction between the components of the binary mixture. The basic inference is that $S_{cc}(0) < S_{cc}^{id}(0)$ implies a tendency for heterocoordination (preference of unlike atoms to pair as nearest neighbours), while $S_{cc}(0) > S_{cc}^{id}(0)$ implies homocoordination (preference of like atoms as nearest neighbours). For a demixing system, $S_{cc}(0) \gg S_{cc}^{id}(0)$. The experimental determination of $S_{cc}(0)$ from diffraction experiments is quite complicated, however, it can be calculated from the measured activity data.

5. Chemical Short Range Order (CSRO) parameter

The chemical short range order parameter (CSRO) is yet another important parameter proposed by Warren [21] and Cowley [22]. In order to measure the degree of order in the liquid alloy, the Warren – Cowley short-range order parameter [23, 24] α can be computed. Experimentally, α can be determined from the knowledge of the concentration-concentration structure factor $S_{cc}(q)$ and the number-number structure factors $S_{NN}(q)$. However, in most diffraction experiments, these quantities are not measurable. On the other hand, α can be estimated from the knowledge of $S_{cc}(0)$ [25]. Knowledge of α provides an immediate insight into the nature of the local arrangement of atoms in the mixture. $\alpha = 0$ corresponds to a random distribution, $\alpha < 0$ refers to unlike atoms pairing as nearest neighbors whereas $\alpha > 0$ corresponds to like atoms pairing in the first coordination shell. From a simple probabilistic approach, one can show that the limiting values of α lie in the range

$$\frac{-c}{(1-c)} \leq \alpha \leq 1, \quad c \leq \frac{1}{2} \quad \text{and}$$

$$\frac{-(1-c)}{c} \geq \alpha \geq 1, \quad c \geq \frac{1}{2}$$

For equiatomic composition the above relations simply reduces to

$$-1 \leq \alpha \leq 1$$

The minimum possible value of α is $\alpha^{\min} = -1$, which implies complete ordering of unlike atoms as nearest neighbors. On the other hand, the maximum value $\alpha^{\max} = +1$ implies total segregation leading to phase separation.

The computed CSRO is presented in Fig. 4 for perusal.

From Fig.4 we observe that for Al-Mg we get $S_{cc}(0) < S_{cc}^{id}(0)$ for all concentrations. Al-Mg is found to be a glassy alloy both towards Al and Mg rich end while α is throughout negative. The theoretical and experimental data of $S_{cc}(0)$ are in good agreement.

6. Surface Tension

From the point of view of theoretical modeling of surface properties, a statistical mechanical approach, which is derived from the concept of a layered structure [26] near the interface, is very useful. This has been used with great success to model the surface tension in binary liquid alloys [27-29]. The grand partition functions set up for the surface layer and that of the bulk [30] provide a relation between surface (c_i^s) and bulk (c_i) compositions. The resulting expressions are:

$$\begin{aligned}\sigma &= \sigma_1 \left(\frac{k_B T}{A} \right) \ln \left(\frac{c_1^s}{c_1} \right) + \left(\frac{k_B T}{A} \right) \ln \left(\frac{\gamma_1^s}{\gamma_1} \right) \\ &= \sigma_2 \left(\frac{k_B T}{A} \right) \ln \left(\frac{c_2^s}{c_2} \right) + \left(\frac{k_B T}{A} \right) \ln \left(\frac{\gamma_2^s}{\gamma_2} \right)\end{aligned}\quad (14)$$

where σ_i ($i = 1, 2$) are the surface tensions of the pure components at specified temperature, $\gamma_i = a_i / c_i$ and $\gamma_i^s = a_i / c_i^s$ are the activity coefficients, while c_i^s and γ_i^s ($i = 1, 2$) are the component at the surface, respectively. The mean atomic surface area A_i can be calculated from the relation:

$$A_i = 1.102 \left(\frac{\Omega_i}{N_A} \right)^{2/3} \quad (15)$$

where N_A is the Avogadro's number and Ω_i is the atomic volume. The mean surface area A of the alloy has been calculated from the relation $A = \sum c_i A_i$. In conformity with the concept of layered atomic structure near the interface, γ_i and γ_i^s are assumed to be related as:

$$\ln \gamma_i^s = p \left(\ln \gamma_i (c_i^s) \right) + q \ln \gamma_i \quad (16)$$

In the above equation, $\gamma_i (c_i^s)$ implies that we have used the expression for γ_i with c_i replaced by c_i^s . Here p and q are termed as surface coordination functions. They are fractions of total number of nearest neighbors made by an atom within the layer in which it lies and that in the adjoining layer respectively, so that $p + 2q = 1$. For closed packed structures one has $p = 0.5$ and $q = 0.25$.

The surface tension of Al-Mg has been computed at 1073 K because experimental activity data is available at this temperature [10]. The computed result agrees well with the experiment. At the Al rich end $\sigma = 865 \text{ mNm}^{-1}$, while at Mg rich end it is 506.8 mNm^{-1} which agrees with the formula [10].

$$\sigma = \sigma_m - 0.35 (T - T_m) \quad (17)$$

σ_m being the surface tension at melting temperature.

The computed surface tensions at different concentrations have been shown in Fig.5 for perusal. It shows that the surface tension of Al falls sharply with the addition of Mg component. For pure Al, it is 865.0 while with the addition of Mg component it becomes 581.1 mNm^{-1} at $c = 0.2$. Afterwards the surface tension goes on decreasing to 501.5 at $c_{\text{Mg}} = 0.9$. At the Mg end, it slightly increases to 506.8 .

7. Electrical Resistivity

The liquid electrical resistivity of binary alloys is computed through the well-known Faber-Ziman formalism. The form factor $w(\mathbf{k}, \mathbf{q})$ have been obtained through Heine – Abarenkov model potential represented by

$$\begin{aligned}W(r) &= -A \quad \text{for} \quad r < r_m \\ &= -Z/r \quad \text{for} \quad r > r_m\end{aligned}$$

and the local unscreened form factor is given by

$$W^0(q) = \left\{ - \left(\frac{4\pi Z}{(\Omega_0 q^2)} \right) \cos q r_m \right\} - \left\{ - \left(\frac{4\pi Z}{(\Omega_0 q^2)} \right) (\sin q r_m - q r_m \cos q r_m) \right\} \quad (18)$$

r_m having the model radius, Z the valence, A the model parameter, Ω_0 the atomic volume and q the phonon wave vector. The model parameter is evaluated through the usual procedure of matching the logarithmic derivative of inner and outer wave functions. The Vasishtha-Singwi (V-S) form of exchange-correlation has been used to obtain the screened local form factor given by

$$W(q) = \frac{W^0(q)}{\epsilon^*(q)} \quad (19)$$

where $\epsilon^*(q)$ is the modified Hartree dielectric function. The liquid electrical resistivity of the binary alloy is given by

$$\rho = \left(\frac{3\pi}{\hbar e^2} \right) \left(\frac{\Omega}{v_F^2} \right) \langle F_1(q) + F_2(q) \rangle \quad (20)$$

where

$$\langle F_1(q) \rangle = 4 \int_0^1 [c_1 w_1^2(\mathbf{k}, \mathbf{q}) S_{11}(k) + c_2 w_2^2(\mathbf{k}, \mathbf{q}) S_{22}(k) + 2(c_1 c_2)^{1/2} w_1(\mathbf{k}, \mathbf{q}) w_2(\mathbf{k}, \mathbf{q}) S_{12}(k)] \eta^3 d\eta \quad (21)$$

$$\langle F_2(q) \rangle = 4 \int_0^1 [c_3 w_3^2(\mathbf{k}, \mathbf{q}) S_{33}(k) + 2(c_2 c_3)^{1/2} w_2(\mathbf{k}, \mathbf{q}) w_3(\mathbf{k}, \mathbf{q}) S_{32}(k) + 2(c_1 c_3)^{1/2} w_1(\mathbf{k}, \mathbf{q}) w_3(\mathbf{k}, \mathbf{q}) S_{31}(k)] \eta^3 d\eta \quad (22)$$

where $\eta = \frac{q}{2k_F}$.

The concentration dependence of computed electrical resistivity of Al-Mg has been shown in Fig.6.

Fig.6, shows that the liquid electrical resistivity of Al-Mg ranges from 13.49 $\mu \Omega \text{ cm}$ ($c_{\text{Mg}}=0$) to 38.19 $\mu \Omega \text{ cm}$ at equiatomic composition, finally decreasing to 14.16 ($c_{\text{Mg}}=1$). The electrical resistivity of this system is found to be symmetric about $c_{\text{Mg}}=0.5$ (equiatomic composition). No anomalous value is obtained at any concentration.

9. Conclusions

The present study based on the Percus-Yevik hard sphere reference system, complex formation model of binary alloys has been successfully applied to the study of the alloying behaviour of Al-Mg alloy at 1073 K. An insight into the structural and compositional details has been obtained through this study.

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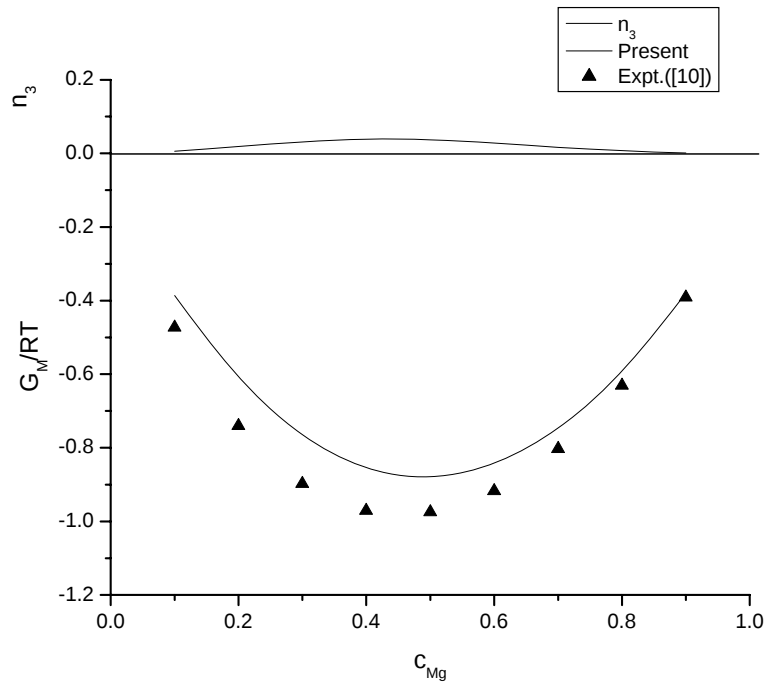


Fig. 1. Number of Complexes (n_3) and Gibb's Free Energy of Mixing (G_M / RT) of Al-Mg

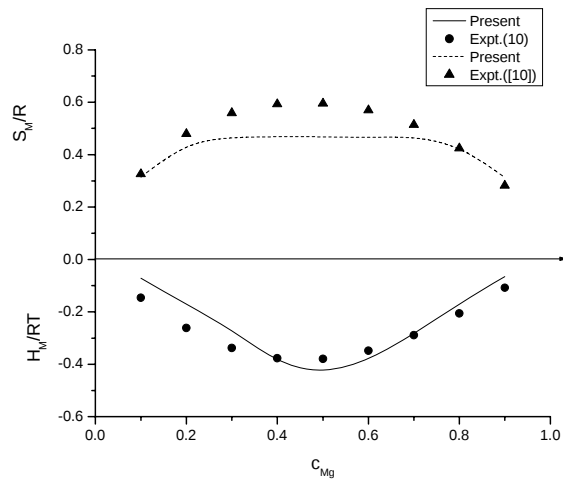
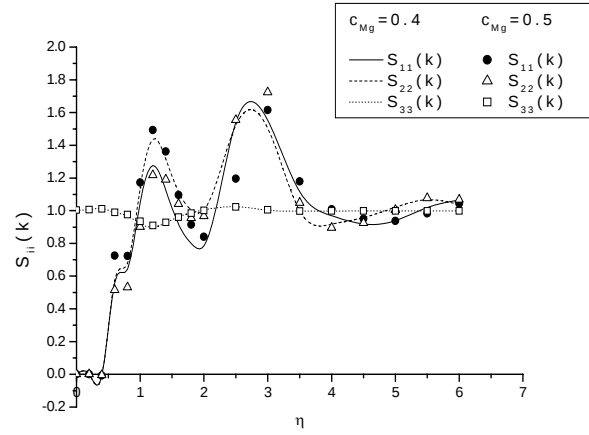
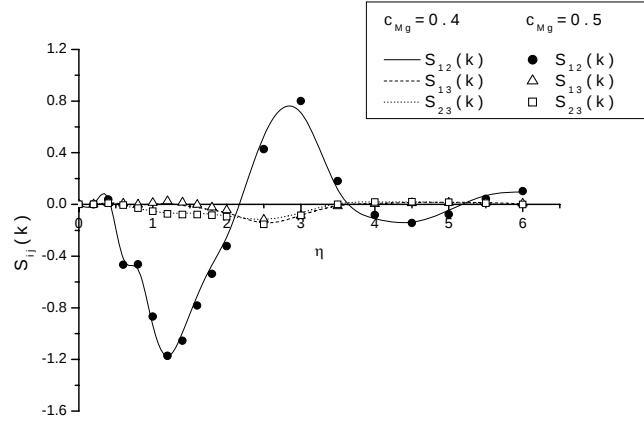


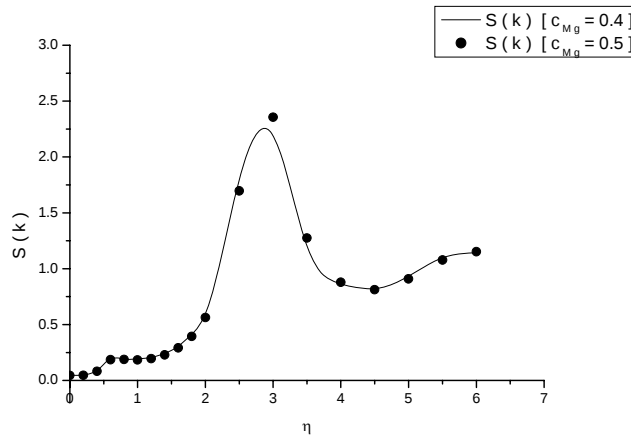
Fig. 2 Heat of Formation and Entropy of Mixing of Al-Mg



(a)



(b)



(c)

Fig. 3. (a) Partial structure factors $S_{ii}(k)$ of Al-Mg liquid alloy for the atom pairs at $c_{Mg} = 0.4$ and 0.5 .
 (b) Partial structure factors $S_{ij}(k)$ of Al-Mg liquid alloy for the atom pairs at $c_{Mg} = 0.4$ and 0.5 .
 (c) Total structure factor of Al-Mg liquid alloy at $c_{Mg} = 0.4$ and 0.5 .

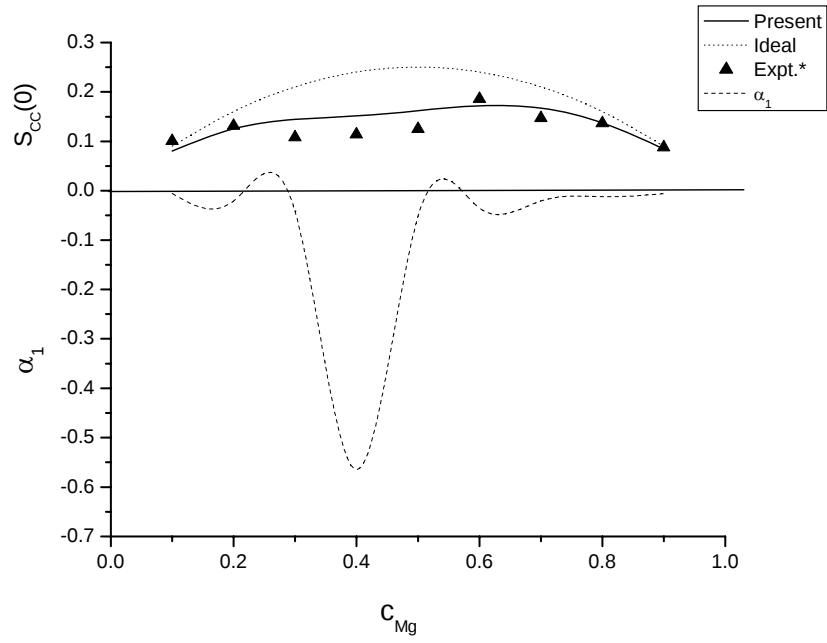


Fig. 4. $S_{cc}(0)$ and CSRO (α_1) for Al-Mg

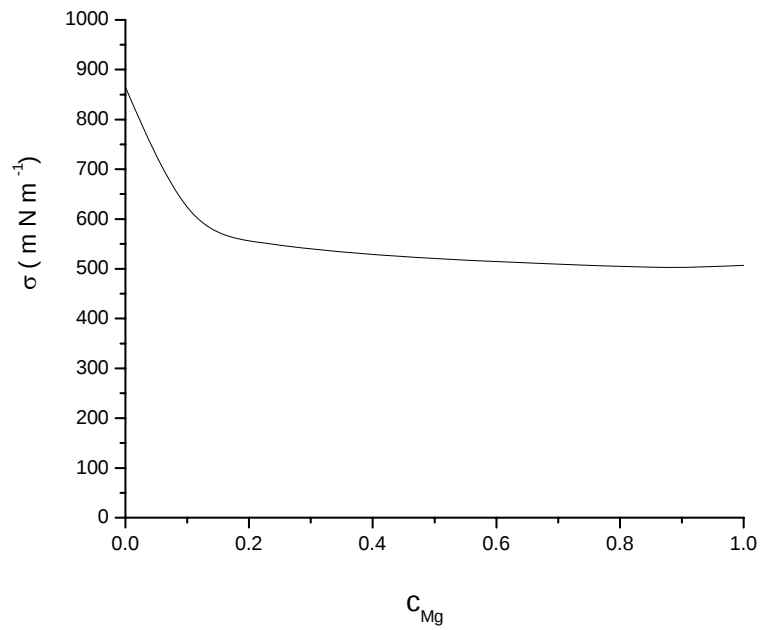


Fig. 5. Surface Tension of Al-Mg

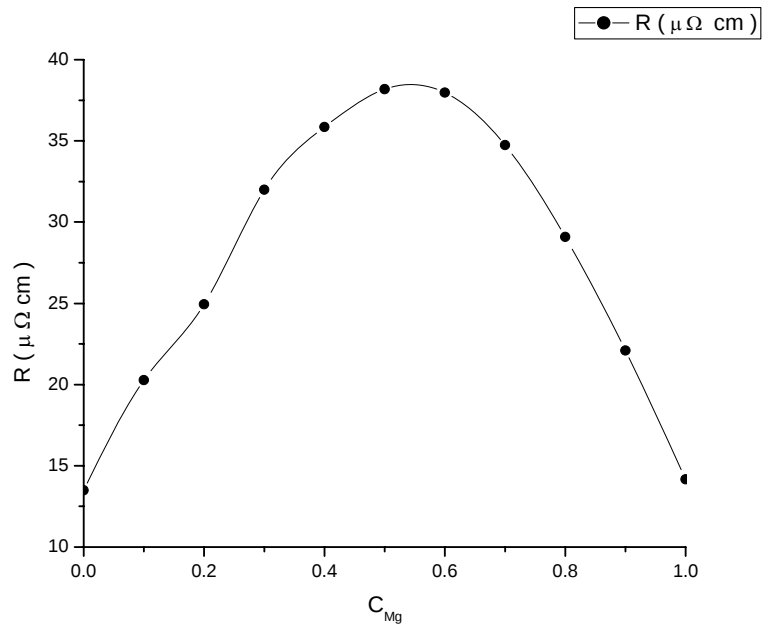


Fig. 6 Electrical Resistivity of Al-Mg Alloy



BBSC's Global Scientific Council

The Global Scientific council was formed during first Bihar Science conference, 2008 (BSC 2008) for the purpose of organizing science conferences, starting science magazines/journals, seminars, workshops, orientation programs and establishing R&D centers etc.

Aims and Objectives:

1. To advance and promote the cause of Science in Bihar
2. To hold Annual Conferences and Scientific festivals at suitable places in Bihar
3. To hold seminars, workshops, orientation programs as regular feature
4. To publish proceedings, journals for popularizing Science and scientific achievements
5. To provide guidance to BB Society to start and execute the scientific projects and help/support at any stage of the execution of the project.
6. To form research groups and recommend society to help those groups for their research projects from our global networks.
7. To provide guidance, support and consultancy to Govt. and non Govt. agencies.

Projects and Events under Scientific Council

A. Annual events:

1. Bihar Science Conference: February Every Year
2. SciTech Fest: November every year

B. Regular Events: To organize seminars, workshops, orientation programs on cutting edge technology.

C. Regular Courses: Personality development courses, Chip design courses, Bioinformatics courses, Nano science courses, Software /Hardware courses, e-learning courses or any other courses recommended by the council.

D. Scientific Journals/Magazines: To start science magazines/journals (Print and online version).

E. To assist R&D center/Institutes/Universities/Companies in association with Govt or any other groups or individuals.

F. To establish Center for learning, discussions, seminars, workshops, orientation programs with all basic infrastructures in other cities of Bihar

G. To establish Placement and consultancy centers

H. To establish Development projects Execution Center

I. To help needy students, researchers of Bihar and providing guidance and support to them.

Criteria of Membership of the Global Scientific Council

On the basis of the local meeting under chairmanship of Prof J.Thakur (other members who attended the meeting were Prof. R. P. Sinha - Former VC, Mithila University, Prof. R. K. Sinha –Professor of Zoology, P. U., Dr. B. K. Sharma Head, Electronics, N. I. T., Patna, Dr U. N. L. Mathur, Head, Physics, Science College, Patna, Prof. S. P. Verma, Retd. Prof. of Physics, Science College, Patna, Shri S. N. Sandhwar-Manager, Operation, BBSC and Shri Vijay Sharan – P. R. O. BBSC) at Dept of Physics, Patna University on Sept 6, 2007 and then global conference meeting, the following criteria were decided for the Global core Scientific Council.

- The **core Scientific Committee** will comprise of **15 members from India** in general and Bihar in particular. Each stream of science will have maximum three members. **10 more members (preferably 2 from each stream) from foreign countries** will be a part of this committee.
- The committee has categorized all streams of S&T into 5 streams as per CSIR, Govt of India, viz; Physical Sciences, Chemical Sciences, Mathematical Sciences and Computers, Life Sciences and Earth Sciences.
- The **minimum educational qualification decided for the core committee members is a PhD**. However, non-PhD will also be considered based on their academic profile, interest in the pursuits of science and commitment to work for creating a scientific research environment in Bihar.



- All members should be registered members of BiharBrains society.

Membership Fee:

S.N	Category	I: INDIAN (In Rs)	N: NRI / Foreigners (in USD)
1	Lifetime	1500	501
2	Yearly	501	201
3	Student Yearly	201	101

Nominated Members of the Global Scientific Council

(Category: Abroad)

S.N	Name	Designation/Address	Subject
1.	Dr. Manis Kumar Jha	Invited Scientist, KIGAM ,S.KOREA	Chemical Science
2.	Dr. Sudhir Ranjan	Scientist ,Pittsburgh ,USA	Chemical Science
3.	Prof. Brajendra Mishra	Director, Colorado School of Mines, USA	Chemical Science
4.	Dr. M. Abul Farah	Research Scientist, Chosun University, S. Korea	Biotechnology/Life Sciences
5.	Dr. Dinesh kumar Singh	Green Center for system Biology,Texas,USA	Biotechnology/Life Sciences
6.	Dr. Bhaskar Choubey,	Univ of oxford, UK	Electronic Science
6.	Prof Animesh Jha	Univ of Leeds,UK	Physical Science
8.	Prof. Upendra. N. Mishra	Chief Technologist, Systems Engineering Directorate, NASA,USA	Physical Science
9.	Dr. Ajay Kumar Jha	Colorado state Univ,USA	Agriculture Science/Earth Science
10.	Prof.Dr. Hari shankar Sharma	Upsala Univ, Sweden	Medical Science
11..	Mr. Ashish Kumar	Univ of oxford,UK	Medical Science
12.	Dr. Rajesh Kumar Mishra	Assistant to the president, A-1 Specialized Services Inc,USA	Advisor

Category (India)

S.N	Name	address	Subject	Post
1	Prof. J. Thakur	Former VC,PU		Patron
2.	Prof. I Ahson,	Pro VC PU		Patron
3.	Prof. A. Yadav	Former-VC, BRABU		Advisor
4.	Prof Rajmani Pd. Sinha	Former-VC,Mithila University & Prof at Dept of Physics, Patna Univ,Patna		Chairman
5.	Prof. Dolly Sinha	Dept of Physics,MM College Patna Univ,Patna	Physical Science	Convener



6.	Prof. (Dr.) H.C.Verma	Prof. Of Physics	Physical Science	Member
7.	Prof Vijay Singh	TIFR,Mumbai	Physical Science	Member
8.	Prof Raman Jha	HOD, Dept of Physics, SMU ,Sikkim	Physical Science	Member
9.	Dr. Santosh Kumar	Dept of Physics, BS College, Danapur	Physical Science	Co-convener
10.	Prof. KV Srinivasan	Former head ,Dept. of Chemistry, Patna University ,Patna	Chemical Science	Member
11.	Prof M.K.Mishra	HOD, Chemistry, IIT Mumbai	Chemical Science	Member
12.	Prof Jainendra Kumar	HOD,Biotechnology, College of Commerce, Patna	Biotechnology/Life Science	Member
13.	Prof. R.K. Sinha	Dept. of Zoology, Patna University, Patna	Biotechnology/Life Science	Member
14.	Prof AK Ghosh	Department of Botany, AN College, Patna	Biotechnology/Life Science	Member
15.	Prof Santosh Kumar,	Former head CWRS, NIT Patna	Agriculture/Earth Science	Member
16.	Dr. B.K. Sharma,	HOD Electronics, NIT Patna	Electronic Science	Member

Note: MEMBER means Subject wise convener

A n n o u n c e m e n t



2nd BIHAR SCIENCE CONFERENCE

January 30 to
February 1, 2009

PG Center
College of Commerce
Magadh University
Patna

Organized by
BiharBrains Development Society
Hosted by
Magadh University
Patna

For ongoing activities please visit www.biharbrains.org

Patrons

Prof. S. E. Hasnain, SAC, PM & VC, Hyderabad University, Hyderabad
Prof B.N. Pandey, VC, Magadh Univ, Bodh Gaya
Bibhuti Bikramaditya, Global Chairman, BiharBrains

Chairman

Prof Jainendra Kumar, Head, PG Dept of Botany and Biotechnology, College of Commerce,
Patna

Vice –Chairman

Dr. Kumar Virendra Sinha, HOD, Dept of Physics, BS College, Danapur
Dr. Kalpana Shahi, Dept of Chemistry, JD Womens College, Patna

Convener

Dr. Santosh Kumar, BS College, Danapur

Prof. R. P. Sinha , (ex-VC LNMU) Chairman, Global Scientific Council, BiharBrains

Abstracts are invited for oral and poster presentation from the research areas such as
Physical Sciences, Chemical Sciences,
Biological Sciences, Mathematical Science,
Medical Sciences, Clinical Psychology,
Earth Sciences, Electronics and Information
Technology

Last date for Abstract Submission:
Jan 1, 2009

Last Date for Advanced Registration:
Jan 15, 2009

Abstract will be submitted preferably by
email or it can be sent to the address below:

BiharBrains Scholastic Center
(under BBrains Development Society)
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Apsara

Kadam Kuan, Patna 800003

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For Complete Details Please visit Conference Website: www.bbscindia.com/ScienceConference