

# SAHAYOG



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July 2009

## Workshops / Seminars

### Awareness workshop on Low Temperature and High Magnetic field Facilities at UGC-DAE CSR Indore



The Indore Centre of UGC-DAE Consortium for Scientific Research organized a two-day awareness workshop on “Low Temperatures and High Magnetic Field Facilities at UGC-DAE CSR, Indore” under the aegis of DST during March 6-7, 2009. This is the third in the series that aims in popularizing the need for the low temperature and high magnetic field. The objective of this workshop was to create awareness among the scientists and students from different universities and institutes, about the low temperature and high magnetic field facilities at CSR, Indore. The participants to this workshop were more than 100 other than the in-house, out of which about 75 were from various universities and institutes drawn from all parts of India. They could interact with about 18 subject experts who have delivered interesting talks in this LTHM arena.

During the inaugural function, Prof. Ajay Gupta, Centre Director of UGC-DAE CSR, Indore Centre welcomed the gathering. Dr. P. Chaddah, Director of UGC-DAE CSR, formally welcomed the Chief Guest Dr. B.A. Dasannacharya and the august audience. Dr. B.A. Dasannacharya delivered the inaugural address highlighting an historical overview of the efforts taken by Consortium and the reminiscence of the initiatives by Prof. R. Srinivasan (former Director of the Consortium) and his subsequent successors. Center Directors of Mumbai and Kolkata Centres and Scientists from CAT and DAVV attended the workshop. After proposing a brief vote of thanks, Dr. V. Ganesan, CSR, Indore continued to deliver the first scientific talk on “Interesting results with 14T/0.3K PPMS for resistivity and heat capacity” and Dr. A. Banerjee, CSR, Indore explained the “14T VSM and its capabilities” in his talk by taking interesting examples in the area of manganites.

In the next session, Prof. A.K. Majumdar, SNBNCBS, Kolkata, presented a lucid introduction on “Resistivity minima in metallic systems and Ni/TiN multilayers”. Dr. A. Bharati, IGCAR, Kalpakkam, delivered a talk on “Superconductivity in Fe Based Arsenides Ru substitution, High Pressure studies & Critical properties”. In afternoon session, Dr. D.G. Kuberkar,

Saurashtra University, Rajkot delivered a talk on “Studies on manganites: nanostructures and thin films”. Dr. S. Armugam, School of Physics, Bharathidasan University delivered a talk on “Pressure effect on ferromagnetic phase transition in Sm-Nd-Sr-Mn-O single crystals”. Dr. V.R. Reddy, CSR, Indore delivered a talk on ‘Low temperature and high magnetic field Mossbauer and MOKE system – a new facility at CSR, Indore’. In evening session, Dr. Shubham Majumdar, Indian Association for the Cultivation of Science, Kolkata delivered a talk on “Magnetic and transport studies on Ni<sub>2</sub>MnSn-derived shape memory alloys”. Dr. R. Rawat, CSR, highlighted the ‘Facilities with 8 Tesla Magnetic Field’.

In morning session of 7<sup>th</sup> March, 2009, Prof. Ramakrishnan, TIFR, Mumbai discussed about “ULT: Pain and Pleasure”, wherein he dealt with technicalities involved in reaching temperatures below 1K. Dr.S.B. Roy, RRCAT, Indore gave an interesting talk on “Fulde-Ferrel-Larkin-Ovchinnikov state in type-II superconductors”. Dr. Vasudeva Siruguri discussed about the “LTHM Neutron Diffraction facility” while Dr. P. Venugopal Reddy, Osmania University, Hyderabad, delivered a talk on “Magneto transport behavior of some monovalent doped manganites “. Dr. Archana Lakhani, CSR, Indore gave an impressive talk on a front line facility “ Scanning Probe Microscopy at Low Temperature and High magnetic Fields”. Dr. S. Patnaik, JNU, New Delhi discussed at length “Current trends in material science at low temperature”, while, Dr. K.G. Suresh discussed the “Recent results on the magnetism in certain intermetallics”.

The workshop’s last talk was by Dr. P. Chaddah, UGC-DAE CSR on “First Order transitions studied using LTHM”, which was quite impressive and down to earth. The Workshop had a social gathering on the evening of the first day where several student participants could interact effectively with the speakers. The participants could also able to visit the laboratories during this two-day event to know about the utilization of PPMS/VSM systems and other facilities as well. Concluding remarks were made by Prof. A.K. Majumdar, who could highlight the important aspects in a thoroughly made review blended with his humorous tone mesmerized the audience and the participants aired their feedback on usefulness and happiness over the workshop.



### **New Appointment:**

Smt. T. Shiyamala joined the Indore Centre of the Consortium on June 17, 2009 as Clerk-Typist. She has been initially posted at the Node at Kalpakkam.

**iva&ana evalit knalki ko Agal xaaalmi%vark (saktu ek idvasalya va&ainak sahaizi)**

vaaiYak prpranasar yajalsal-Dle[- va&ainak Anasallana salkila (UGC-DAE CSR) va Aar•Aar•kIT• (RRCAT) na ek ihndi va&ainak sahaizi (jipivayak) ka 20 maca 2009 ka sqaanlya esa•jal•esa•Aaya•TI•esa• (SGSITS) malsah Aayaajana ikyya. Da° pivalNa caDza (inadlak, CSR) na [na Baayaa[- sahaizyaabli mahaa ka AtidSalya Ca-abli va&ainak-pitBaa-clabna saosanballat kr rKalkt ikyya. Da° dlnadyaala sakti (tal•e•Aar•sal•, BARC) kom#ya Aaitqya malsabna hu[- [sa sahaizi malsahajak saktqaanaabli kova&ainakabha mahai vaValayalna paQyaapkabna%varkabl ko ivaiBanna phlaiAabpr vyaa#yaana idyava saargaiBat cacaa-ki. [sa Avasar pr va@taAabli kovaata saaraBa va Anya laGa laKahlyau ek smaarka ivamaana ikyya gayaa, ijasanmliAayaajak saktqaanaabli hailayaa ivakasa gaitivaiQayaabli ka Bal salkapt ]llak h0

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salkila va&ainak Da° TI• Ealpit na prpragat (riDyaagaafi) va isalkaTara-AaQairt icaiK%akly pitibana ivaiQyaabli ka tilanaa%vark/gablaa%vark ivaSlabla krnao ko saaga-saaga Avaraet pwit (latter's) ki tknalki EadztaAabli (ivaSabli kr [sanmli xa-ikrNaabli ka klaa-AnrNa, Phase-Shift ]pyaaga) pr pkaSa Dalaa. iWtly salkila-va@ta va&ainak Da° malkula gabta naok-alana (spallation) nyatara saact ki mliabatt pikyya va [saki naaiBaklyya iva#alNDna (fission) evalsalWayana (fusion) saactabsao Eadztr ]padgyata (nyatara-sahyya va - } jaa-saldBa-mli) ka valana ikyya.



**icaiK%akly pitibana mliisalkaTara ivaiKrNa ka ]pyaaga - Da° TI• Ealpit**

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isalkaTara saact yaapK AavaK-a-xa- pr Ait-tlv evalmidktsab@t xa-ivaiKrNa pdana krto h0 xa-ikrNaabli ka pcaarNa yaajak Apvat naalk ( $n = 1 - d - ib$ ) Wara vaiNat hada h0 jaha AvaSaablaNa **b** va klaa-AnrNa (Phase-Shift) **d** mliSaBal Apvatna-pBaava AntivaT h0 narma- } tkabli ko icaiK%akly pitibana ki dRVT sa \$icakr } jaa-Altala (15 - 25 keV) mli AvaSaablaNa ko binaasbat klaa-AnrNa pd tkribana 1000 gaava h0 [sako ]pyaaga ka Aitir@t laBa AvaSaablaNa ki } jaa-inaBar ta ( $b \propto E^4$ ) komakabalaoklaa-AnrNa ka Qalma ( $d \propto E^2$ ) ppat h0





## New Instruments / Additions

### Indore Centre:

#### 7-Tesla SQUID magnetometer

A 7-Tesla SQUID magnetometer with various options is installed (Fig. 1) in the end of 2008. This has an integrated cryocooler-dewar system that recondenses the helium directly within the dewar which is called EverCool system. Both dc-magnetization and ac-susceptibility can be measured with this SQUID magnetometer from 2-320K. The residual field of the 7-Tesla superconducting magnet can be reduced to  $< 50$  mOe with ultra low field option.



Some preliminary results from the system are given below:

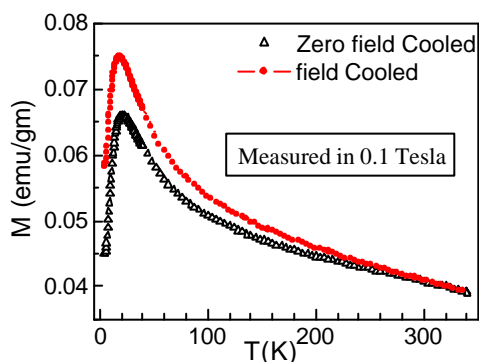


Fig. 2: Dc-magnetization of a molecular magnet (sample of user from BHU)

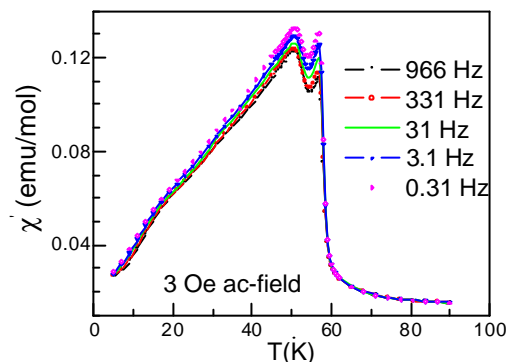


Fig. 3: Ac-susceptibility at different frequencies of a multiferroic (in-house) sample

#### Laser Confocal Scanning Optical Microscope (LCSOM) (Fluorescent modes with Multi line Ar and He-Ne lasers, DIC contrast, Linkam Heating and Cooling stages 80-800K)

In recent years there is a considerable interest in visualizing the phase transitions at the microscopic level. In view of this a Confocal Laser Scanning Optical Microscope LSM 510 META from Carl Zeiss has been acquired with different modes like bright field, epi polarization, dark field, differential interference and fluorescence contrast etc. Apart from the material science applications, the Confocal system with Multi line Argon and He-Ne lasers has much importance for biological studies. Noteworthy feature is the Linkam heating and cooling stage that is compatible with that of Zeiss Microscope with a long working distance objective (20 $\times$ ). Using this one can track the phase transitions with a wide range of temperatures from 80K to 600K. Evolution of domain structures across the martensitic transition ( $T_m$ ) in the ferromagnetic shape memory alloy system  $Ni_{2.22}Mn_{0.78}Ga$  studied is shown as a test case. Giant morphological changes in the form of appearance of well-developed domains that are propagating with different directions are seen for the composition in which  $T_m = T_c$ .

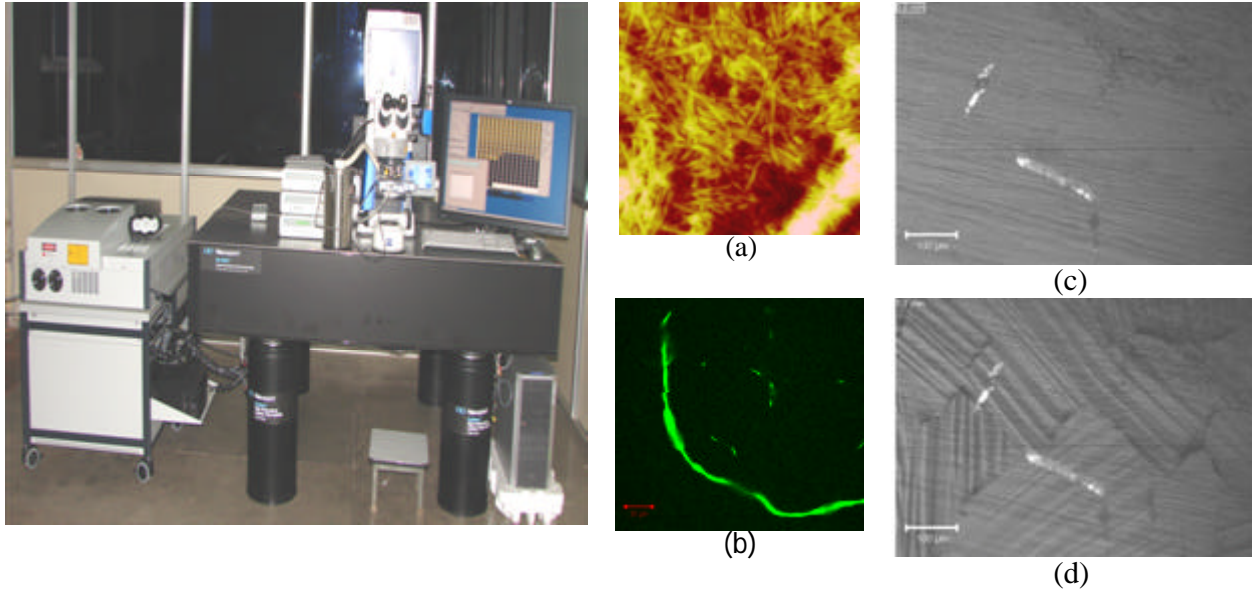


Figure: 1. Photograph of the Laser Confocal Scanning Optical Microscope system along with sample micrographs. a) AFM (50 $\mu$ ) and b) Fluorescence (Bar 20 $\mu$ ) images of elongated E.coli with drug (Cefoperazone+Sulbactam). Micrographs of Ni<sub>2.22</sub>Mn<sub>0.78</sub>Ga across the phase transition ( $T_m=T_c\sim 334K$ ) - c) before the  $T_m$  and d) after the  $T_m$ .

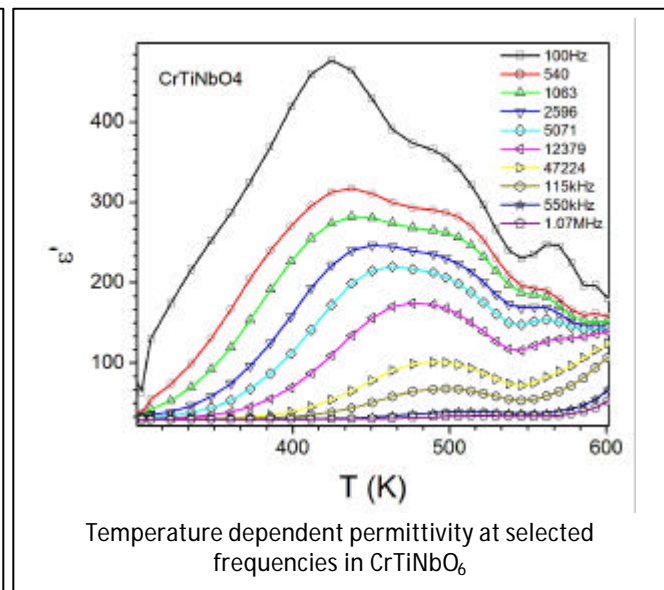
## At Mumbai Centre

### Impedance analyzer with low-temperature attachment

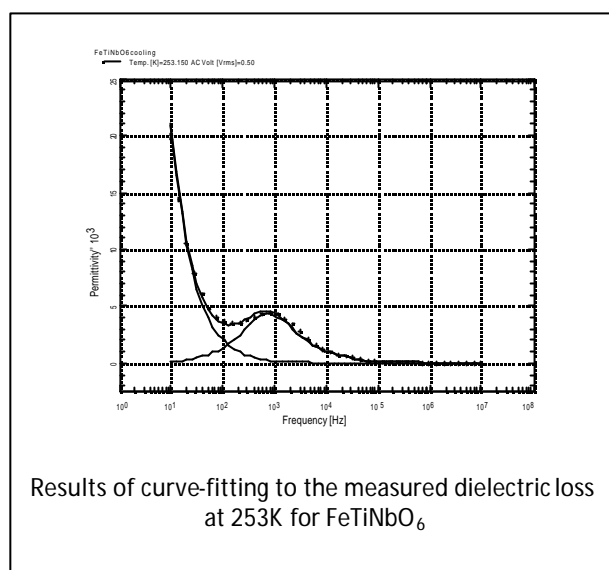
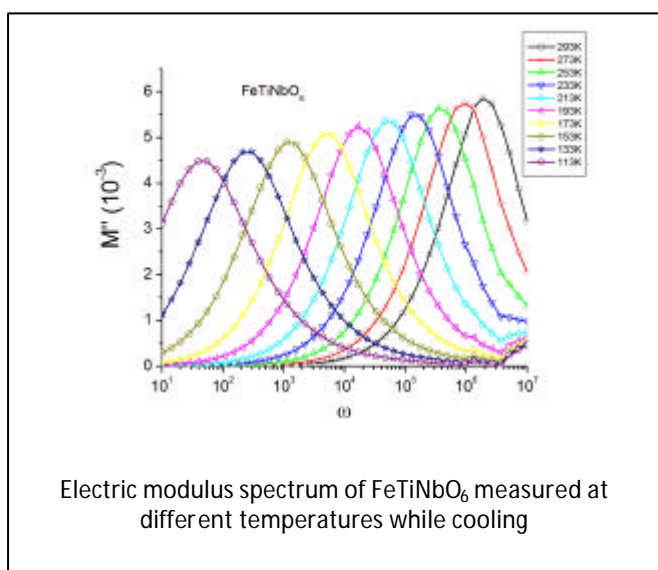
A new impedance analyzer (Novocontrol, Germany) with facility for measurement at low temperature was acquired recently to carry out dielectric studies over a wide temperature and frequency range. The system is capable of performing measurements from 3 $\mu$ Hz to 20MHz at temperatures from -160C to about +400C using a Novocontrol Quatro liquid nitrogen cooling/heating system and a Novocontrol BDS1200 sample holder. The loss tangent ( $\tan\delta$ ) accuracy is better than  $10^{-4}$ . This system replaces the obsolete HP4194A impedance analyzer that is out of order. The system is fully computer-controlled, and includes software for data analysis. Measurements on solid samples can be carried out with temperature accuracy of  $\pm 0.1C$ .



Photograph showing spectrometer identical to that installed at Mumbai Centre



Temperature dependent permittivity at selected frequencies in CrTiNbO<sub>6</sub>

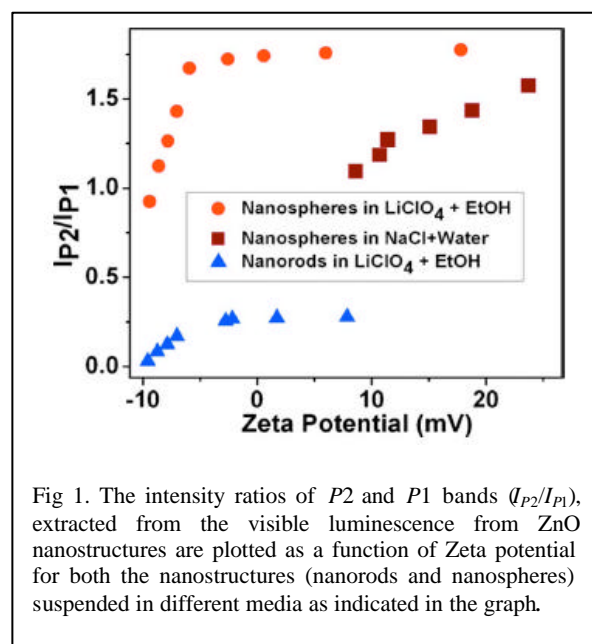


## At Kolkata Centre:

### Light Scattering Setup for Characterization of Colloidal Particles

A light scattering setup (Malvern, UK, Model Zetasizer Nano ZS 3500) is installed in Kolkata Centre and is available for use by the interested university groups. This instrument provides non-invasive techniques to measure three characteristics of particles or molecules, namely, Particle size, Zeta potential and Molecular weight, in a liquid medium. The Zetasizer system has also options for autotitration, protein melting and pH measurements. This setup is fitted with a 532 nm green laser and precise temperature control necessary for reproducible, repeatable and accurate measurements. This system determines the size in the range of 0.6 nm – 6 μm by first measuring the Brownian motion of particles in a sample using Dynamic Light Scattering (DLS), that is, by analyzing intensity fluctuations in the scattered light and then interpreting a size by using correlation function based on Stokes-Einstein theory. The software can provide detailed information about size as a function of intensity, volume and number distributions. The Zetasizer calculates the Zeta potential by determining the Electrophoretic mobility and then applying the Henry equation. The electrophoretic mobility is obtained by performing an electrophoresis experiment on the sample and measuring the velocity of the particles using Laser Doppler Velocimetry. Another important parameter, Molecular weight, in the range of 10<sup>3</sup>-10<sup>7</sup> Da, is determined by this equipment using the process of Static Light Scattering. The molecular weight is determined by measuring the sample at different concentrations and applying the Rayleigh equation. The standard approach for this measurement is to first measure the scattering intensity of the material, in question, relative to that of well described ‘standard’ pure liquid (commonly toluene) with a known Rayleigh ratio.

This setup has tremendous applications in the area of nanomaterials, polymer and biological systems. A group from Chemistry Department, Kalyani University has studied the modulation of dye aggregation in the presence of metal nanoparticles. These studies performed in neat aqueous solution as well as in surfactant media, provide useful insight into the effect of metal





nanoparticles on the aggregation behaviour of Xanthene dyes. The hydrodynamic diameter of the synthesized nanoparticles lie in the range 3-4 nm, indicating a fair amount of polydispersity.

Zeta potential of ZnO nanostructured materials was measured with this setup by a group from S. N. Bose National Centre for Basic Sciences in order to understand the ionic environment control. It was established that change in the visible emission of ZnO (or  $I_{P2} / I_{P1}$  ratio) occurs due to the change in the surface charge or surface potential of the nanospheres/ nanorods by correlating the intensity of the P2 line with the measured zeta potential values (Fig. 1) (M. Ghosh and A. K Raychaudhuri, *Appl. Phys. Lett.* **93**, 123113, 2008).

In a work jointly with Power Department, Jadavpur University, formation of carbon nanoparticles in partially premixed flame below the Soot Laden Zone has been established. Hydrosols have been prepared by extracting samples from different points across the flame. Dynamic Light Scattering (DLS) results of samples from different axial (z) and radial (r) locations show gradual increase in the size of nanoparticles in the downstream direction (Fig. 2) (B. Paul, A. Datta, A. Datta, A. Saha, *Combustion & Flame*, 2009, in Press).

In our laboratory, we have synthesized a variety of semiconductor/dendrimer nanocomposites with view to control size and surface functionality. DLS measurements revealed that the ZnS/dendrimer nanocomposites are composed of primary particles, their clusters and superclusters (Fig. 3). It was demonstrated by measuring Zeta potential that both  $\text{NH}_2$  and OH terminated dendrimer can have positive values (in the range of +6 to +25 mV) at physiological pH indicating its suitability for attachment with biological systems (S. Ghosh, A. Priyam and A. Saha, *J. Nanosci Nanotechnol.* 2009, (doi:10.1166/jnn.2009.1367).

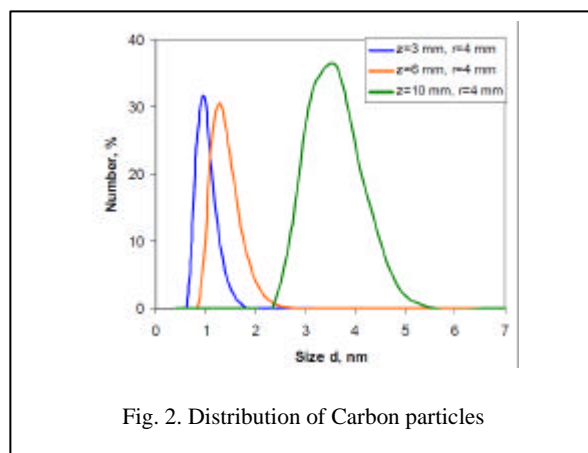


Fig. 2. Distribution of Carbon particles

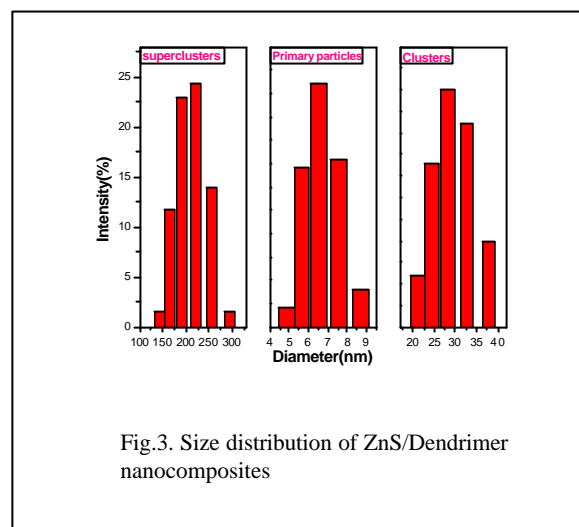


Fig.3. Size distribution of ZnS/Dendrimer nanocomposites

## Article:

### Possible use of Radio-Attenuated Leishmania Parasites for a Vaccine Design against Indian Kala-azar

Madhumita Manna Bethuene College, Kolkata, Anindita Chakraborty UGC-DAE CSR, Kolkata Centre

Ionizing radiation ( $\text{Co}^{60}$ ) has been employed to study its potential to induce attenuated forms of virulent parasites to combat visceral Leishmaniasis or Kala – azar, a serious tropical disease prevalent in India. Kala-azar is caused by protozoan parasite, *Leishmania donovani* showing multifaceted clinical manifestations. The full-blown symptoms of the infection include fever, cough, diarrhea or dysentery, weight loss, anemia, edema, bleeding and hepatosplenomegaly. There is no vaccine for any kind of Leishmaniasis till today despite several attempts so far.

BALB/c mice were immunized i.e. with  $\gamma$ -irradiated *L.donovani*. A second immunization of the above mice i.v. was done with same dose of  $\gamma$ -irradiated *L. donovani* after 15 days of first immunization. Parasite challenge



was given after 30 days of first immunization with virulent, non-irradiated *L.donovani* promastigotes. Protection against Kala-azar was estimated through organomegaly study for spleen and liver of the mice alongwith immunoprofiling through measurement of nitrite and superoxide anion generation and cytokine release assessment from the experimental groups by ELISA and RT-PCR techniques .Protective immunity in clinical VL depends on the induction of T cells producing Th1 cytokines. Th1 cells produce IFN  $\gamma$  and Interleukin 2 (IL-2) which are protective cytokines, whereas Th 2 cells produce IL-4, and IL-10, which are involved in disease progression.

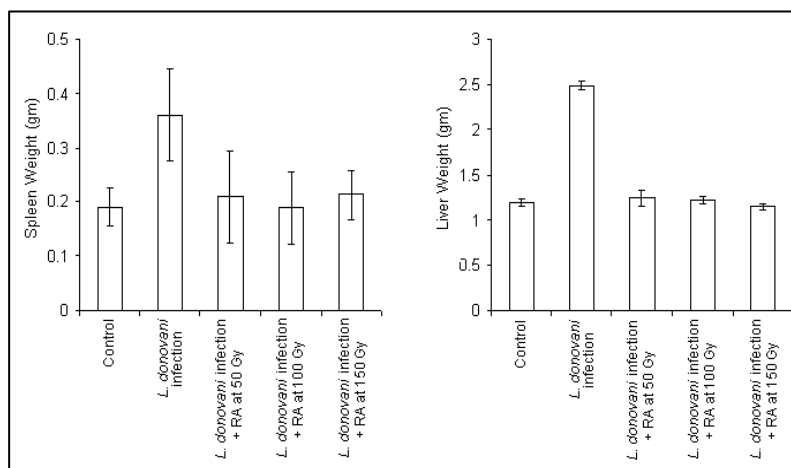


Fig 1. Protection from organomegaly [spleen & liver] in the vaccinated mice groups

In this study, it was observed that the experimental mice exposed to radio attenuated parasites before administering the virulent leishmanial parasites, showed no organomegaly when compared to the group that received virulent parasite infection (Fig 1.) An increase in the levels of Th1 cytokines, IFN  $\gamma$  and IL-2 was also observed in the radio-attenuated parasite treated group whereas the group which was not exposed to radio-attenuated parasites but were infected with only the virulent ones, showed progression in the disease (Figs 2& 3).

Findings reflect that radio-attenuated leishmania parasites can be used as immunoprophylactic agent for visceral leishmaniasis or Kala-azar. Such a study on visceral leishmaniasis is the first of its kind and can go a long way in making a breakthrough for vaccine design for prophylaxis against Indian kala-azar.

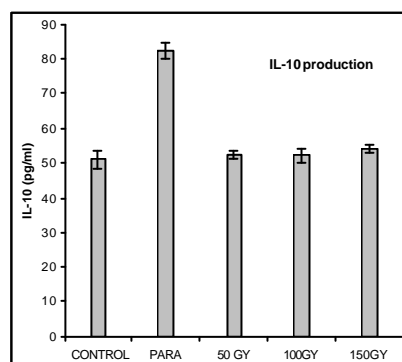
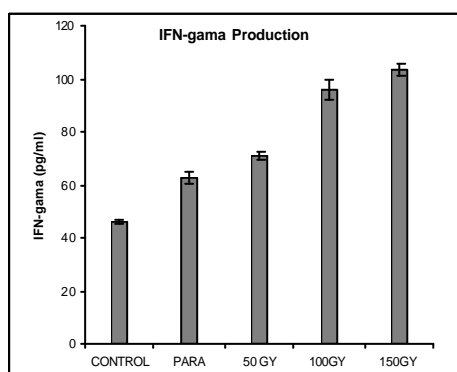


Fig 2 & 3. Expression of Th1 cytokine [IFN gamma] and suppression of Th2 cytokine [IL10] in the vaccinated groups

### Following students of the Consortium obtained their PhD during January-June 2009

Student	Thesis Title	University	Supervisor
Parasmani Rajput	“Depth Resolved Structural Studies in Thin films and Multilayers Using X-ray Standing Waves	DAVV, Indore	Prof. Ajay Gupta
Soma Banik	Studies on Heusler alloys	DAVV, Indore	Dr. SR Barman
Ram Prakash	Synthesis and characterization of Magnetic oxide thin films.	DAVV, Indore	Dr. D. M. Phase
M. Shahid Anwar	Structural and dielectric studies on some perovskite based oxide ceramics	DAVV, Indore	Dr. N.P. Lalla
Shailja Tiwari	Growth and characterisation of pulsed laser deposited magnetite thin films	DAVV, Indore	Dr. D. M. Phase
Ashim Kumar Pramanik	Studies of Physical Properties and Their Relation to the Phase Separation Phenomenon in the Half Doped Manganites	DAVV, Indore	Dr. A. Banerjee

### Foreign visits of Employees / Students during January to June 09

Sl. No	Name	Place visited	Date	Purpose
1	Ms. Deepti Kothari	University of California, Santa Barbara, USA	25-28 <sup>th</sup> January 2009	International workshop on “Magneto-electric Interaction phenomena in crystals”
2	Ms. Deepti Kothari	ELETTRA Synchrotron, Italy	7 <sup>th</sup> May - 3rd June 2009	EXAFS measurements.
3	Dr. V. Raghavendra Reddy	ELETTRA Synchrotron, Italy	7 <sup>th</sup> May - 3rd June 2009	EXAFS measurements.
4	Dr. Ranjeet Brajpuria	ICTP, Trieste, Italy	8-14 <sup>th</sup> March, 2009	International School on Synchrotron Radiation and its Applications
5	Ms. Aditi Dubey	ICTP, Trieste, Italy	8-14 <sup>th</sup> March 2009	International School on Synchrotron Radiation and its Applications
6	Dr. S.R. Barman	Fritz-Haber Institute Berlin, Germany	17 <sup>th</sup> May to 31 <sup>st</sup> July 2009	Experiment on electronic structure & morphology of metal surfaces

### Talks given at CSR:

1. “Study of Magnetic Correlations in Various Oxides using Neutrons”, Dr. S.M. Yusuf, BARC, Mumbai (17 Jan '09)
2. “Ferromagnetic Semiconductors and Oxides as Spintronic Materials”, Prof. G.P. Das, I.A.C.S., Kolkata (2 Feb'09)
3. “Recent Development in Nanomaterials and their Applications: R&D at BHU Nano Science Centre”, Prof. O.N. Srivastava, BHU, Varanasi (10 Feb'09)
4. “Surface and Interface Science at ESRF”, Dr. J. Zegenhagen, ESRF, France (19 Feb'09)
5. “New & Renewable Energy and Nanotechnology Applications”, Prof. S.K. Samdarshi (25 Mar'09)
6. “Nanomaterials and Solar Energy”, Dr. Satish Ogale, NCL, Pune (11 Jun '09)
7. “Metallic and Ferromagnetic Thiospinels  $CuCr_2X_4$  (X = S, Se, Te)”, Prof. Ashok Rastogi, JNU, New Delhi (11 Jun '09)

## Talks given by CSR Faculty:

1. "Growth of Nano-columns of ferrimagnetic Fe<sub>3</sub>O<sub>4</sub> on GaAs", Ram Janay Chaudhari, International Conference on Transport & Optical Properties of Nanomaterials at University of Allahabad, Allahabad, 5-8 January 2009.
2. "Electronic properties of Complex metals", SR Barman at India-Singapore Joint Physics Symposium, SNBCBS, Kolkata, 6-8<sup>th</sup> January, 2009.
3. "Electronic and structural properties of ferromagnetic shape memory alloys studied by density functional theory", SR Barman at International Conference on Active/ Smart Materials (ICASM) in Madurai, 7-9<sup>th</sup> January, 2009.
4. "Magnetic Phase Coexistence" Alok Banerjee, in the "Discussion Meeting on India-Germany Collaboration at DESY for Nanoscience with nano-sized high energy photon beam" held at JNCASR, Jakkur, Bangalore on 13<sup>th</sup> January, 2009.
5. "Photoelectron Spectroscopy and MCD", SR Barman, at India-Germany workshop on Nanoscience with nano-sized high energy photon beam, Bangalore, 13-14<sup>th</sup> January, 2009.
6. "Characterization of magnetic nanomaterials by Mössbauer spectroscopy at Magnetic Nanomaterials and Their Applications", D. Das, at S. N. Bose National centre during January 27-28, 2009.
7. "Role of Scanning Probe Microscopy in the Bio-Nano Senario", V. Ganesan, at State level seminar on Recent advances in nanocrystalline materials and applications, Department of Physics, GB Patel Science College Shahada on 6<sup>th</sup> Feb, 2009.
8. "Excitement in Synthesis and Biological Applications of Functional Quantum Dots", A Saha, National Semimar on Emerging Trends and Advances in Chemical Research at University of Allahabad, February 8-10, 2009.
9. "Role of Scanning Probe Microscopy in the Bio-Nano Scenario" V. Ganesan, at N.M.S.S.Vellaichamy Nadar College, Madurai on 10<sup>th</sup> Feb, 2009.
10. "Interesting aspects of phase transitions" V. Ganesan, for post graduate students of N.M.S.S.Vellaichamy Nadar College, Madurai on 11<sup>th</sup> Feb, 2009.
11. "Interesting aspects of Low Temperature Physics and Microscopy" V. Ganesan, for under graduate students of Jayaraj Annabakym College, Periyakulam on 11<sup>th</sup> Feb 2009.
12. "Controlling phase coexistence in half doped manganites" Alok Banerjee, delivered in the conference on "Physics and Chemistry of Oxide materials" at SNBCBS, Kolkata on 24<sup>th</sup> February, 2009.
13. "Mossbauer spectroscopy", V.Raghavendra Reddy, Department of Physics, Pune University, Pune during 26<sup>th</sup> February 2009 on the occasion of Raman Memorial Conference.
14. "Nanoscale diffusion in thin films and multilayers", Ajay Gupta, 2<sup>nd</sup> International Conference on Physics at Surfaces and Interfaces, Puri, February 2009.
15. "Quasicrystalline metallic adlayers", SR Barman at 2<sup>nd</sup> International Conference on Physics at Surfaces and Interfaces, Puri, 23-27<sup>th</sup> February, 2009.
16. "Swift heavy-ions for controlled modifications of magnetic thin films and multilayers", Ajay Gupta, Indo-French meeting, Bhubaneshwar, March 2009.
17. "Study of intruder configurations in N-18 nuclei in the vicinity of the "Island of Inversion", S S Ghugre, at the Frontiers in Gamma Ray Spectroscopy, held at Tata Institute of Fundamental Research, Mumbai March 02 – 04 2009.
18. "Coexistence of contrasting phases in manganites around half-doping" Alok Banerjee, delivered in the "Indo-US Workshop on Advanced Magnetic Materials and Their Applications" at IIT, Bombay on 4<sup>th</sup> March, 2009.
19. "Experimental Studies on the Metastable Magnetic States in Manganites" Alok Banerjee, delivered at the Mysore University on 13<sup>th</sup> March, 2009.
20. "Growth and characterisation of Fe<sub>3</sub>O<sub>4</sub> nanostructure on GaAs", D. M. Phase, National Symposium on Nanomaterials and applications (SNMA-2009) held at Fergusson College, Pune (March 2009).
21. "Rietveld refinement using FullProf", V. Siruguri, Workshop on Experimental Techniques in Condensed Matter Physics, University of Rajasthan, Jaipur, March, 2009.
22. "Analysis of x-ray diffraction patterns and introduction to the Rietveld method", V. Siruguri, Workshop on Experimental Techniques in Condensed Matter Physics, University of Rajasthan, Jaipur, March, 2009.
23. "Study of first Order transitions", P. Chaddah, Colloquium at DAVV, March 21, 2009.
24. "Study of weak ferromagnetism in multiferroic BiFeO<sub>3</sub> with chemical substitution", V.Raghavendra Reddy, Shimla University, Shimla during International conference on multifunctional oxide materials (ICMOM-09) during 16-18<sup>th</sup> April, 2009.
25. "Exploring room temperature ferromagnetism in pulsed laser deposited thin films of undoped and Fe doped MoO<sub>2+d</sub>", Ram Janay Chaudhari, International Conference on Functional Oxide Materials, at Shimla University, Shimla, 16-18 April 2009.



Dr. Alok Banerjee receiving the Prof. Y.T. Thathachari Research Award for Science 2008 (March 14, 2009)

### Placements of our students

1. Dr. Parasmani Rajput, joined European Synchrotron Radiation Facility (ESRF), Grenoble, France, as Post Doctoral Fellow.
2. Dr. Muhammad Shahid Anwar joined CECRI (CSIR, Karaikudi, Tamilnadu), as Scientist – C.
3. Dr. Ram Prakash joined IIT Kanpur, as Post Doctoral Fellow.
4. Dr. Soma Banik joined RRCAT, Indore, as KSKRA Fellow.
5. Mr. Kaustav Mukherjee joined TIFR, as Post Doctoral Fellow.
6. Dr. Ranjeet Brajpuriya joined MLS University, Udaipur, as Dr. D.S. Kothari Post Doctoral Fellow of University Grants Commission.
7. Dr. Shailja Tiwari joined MLS University, Udaipur, as Dr. D.S. Kothari Post Doctoral Fellow of University Grants Commission

### Awards and Recognitions

#### Students:

1. Dr. Shahid Anwar received the M.P. Young Scientist Award for the year 2008-09.
2. Ms. Sharmistha Bagchi received best poster award at the 2nd International Conference on Physics of Surfaces and Interfaces - PSI2009 held at Puri (Feb. 23-27, 2009).
3. Mr. Sanjay Singh received best paper award for the day (Oral presentation) at the International Conference on Active/Smart Materials- ICASM-09 held at Madurai, Tamilnadu (Jan 7-9, 2009).
4. Best Paper presentation in NSRP-2009 was awarded to Srabanti Ghosh.

#### Users:

5. Mr. Rujuta Doshi, Department of Physics, Saurashtra University, RAJKOT, was awarded First Prize in Oral Presentation at the "Symposium on nanomaterials and their applications (SNMA - 2009)" held at Fergusson College, Pune during 4-6 March, 2009.
6. Ms. Uma Khachar, Department of Physics, Saurashtra University, RAJKOT, was given Best Research paper presentation award at the One day Seminar on "Recent Advances in Condensed Matter & Materials Physics (RACMMP -09) held at M.S University, Baroda on 28th Feb 2009.