Curriculum Vitae

Debarchan Das
Research Scholar
Department of Physics
Indian Institute of Technology-Kanpur
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Personal Information

- Name : Debarchan Das
- Date of Birth : 29-11-1988
- Nationality : Indian
- Gender : Male
- Marital Status : Single
- Spoken Languages : English, Bengali (mother tongue), Hindi
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Present Position:

Senior Research Fellow, Department of Physics,
Indian Institute of Technology-Kanpur, Kanpur-208016, India
• **Thesis Supervisor:** Prof. Zakir Hossain

Academic Qualifications

PhD *in Physics* (2011- Present)
Department of Physics
Indian Institute of Technology-Kanpur, India
CPI: 9.2/10

MSc *in Physics* (2009-11)
Department of Physics
Indian Institute of Technology-Kanpur, India
(Joined the department as a dual degree student)
CPI: 7.7/10

BSc *with Physics, Chemistry and Mathematics* (2006-09)
Rishi Bankim Chandra College, Naihati- 7431645 (Affiliated to University of Calcutta), West Bengal, India
Division/Class: 1^{st}

10+2 *with Physics, Chemistry, Mathematics, Computer Science, English and Bengali* (2004-06)
West Bengal Council of Higher Secondary Education, India
Division/Class: 1^{st}

10-th *standard with Physical science, Life Science, Mathematics, English and Bengali* (2004)
West Bengal Board of Secondary Education, India
Division/Class: 1^{st}

Research experience

• **Crystal Growth:** I have synthesized high quality polycrystalline samples of intermetallic compounds using arc melt and solid state reaction techniques. I have experience of growing single crystals of some Eu- based compounds.

• **Structural Characterization:** I have expertise on structural characterization using X-ray diffraction. I also have experience on metallographic examinations like Scanning electron microscopy (SEM) and Energy dispersive x-ray spectroscopy

• **Physical Properties measurements:**

Magnetic Properties (DC magnetic susceptibility, magnetization)using VSM and SQUID magnetometer, **Transport Properties** (resistivity, magnetoresistance), **Thermodynamic properties** (heat capacity)

List of Publications

1. Muon spin relaxation study on itinerant ferromagnet $CeCrGe_3$ and the effect of Ti substitution on magnetism of $CeCrGe_3$
   Debarchan Das, A Bhattacharyya, V K Anand, A D Hillier, J W Taylor, T Gruner, C Geibel, D T Adroja and Z Hossain
   Journal of Physics: Condensed Matter 27, 016004 (2015).

2. Heavy fermion and Kondo lattice behavior in the itinerant ferromagnet $CeCrGe_3$
   Debarchan Das, T Gruner, H Pfau, U. B. Paramanik, U Burkhardt, C Geibel and Z Hossain
   Journal of Physics: Condensed Matter 26, 106001 (2014).

3. Reentrant Superconductivity in $Eu(Fe_{1-x}Ir_x)_2As_2$.
   U. B. Paramanik, **Debarchan Das**, R Prasad and Z. Hossain
   Journal of Physics: Condensed Matter 25, 265701 (2013).

Conference and Workshop

• Conference on "Current Trends in Condensed Matter Physics", NISER, Bhubaneswar, India, 19^{th}-22^{nd} February 2015

• School on "Basics of Magnetism and Investigations of Magnetic Properties of Materials using Synchrotron Radiation", RRCAT, Indore, India, 24^{th}-28^{th} March 2014

• 57^{th} DAE Solid State Physics Symposium, Indian Institute of Technology, Bombay, Mumbai, India, 3^{rd}-7^{th} December 2012

Research Highlights

Strongly correlated electron systems have attracted considerable attention of condensed matter physics research community due to many exotic properties which include heavy fermion behavior, Kondo effect, valance fluctuation, magnetic ordering and superconductivity. In our effort to search for new rare earth based intermetallic compounds we have synthesized polycrystalline samples of $CeCrG_3$ and performed a comprehensive study of the low temperature properties by means of x-ray absorption spectroscopy (XAS), magnetic susceptibility, isothermal magnetization, electrical resistivity, specific heat and thermoelectric power measurements which corroborate that Cr ions order ferromagnetically below 70 K and

Ce ions possess a stable 3+ valance state in this compound. The Kondo lattice type of the resistivity and the large value of Sommerfeld coefficient (γ) convince us that $CeCrGe_3$ is a moderate heavy fermion system. In order to gain further insight into the magnetic ordering in $CeCrGe_3$, we have performed a muon spin relaxation (μSR) experiment (at the ISIS Muon Facility of the Rutherford Appleton Laboratory, United Kingdom) which reveals the presence of a bulk magnetically ordered state. In addition, to study quantum critical point (QCP) in the system we have used Ti doping. The Cr moment ordering temperature is suppressed gradually with increasing Ti concentration in $CeCr_{1-x}Ti_xGe_3$ up to x= 0.50 showing T_c =7 K beyond which Ce moment ordering starts to dominate and a crossover between Cr and Ce moment ordering is observed. We are also interested to investigate the magnetic structure and crystal field levels of $CeCrGe_3$ by means of neutron scattering experiment.

In addition, I have also worked on iron pnictides ('122' class) to study the interplay between superconductivity and magnetism. We have synthesized polycrystalline samples of Ir doped $EuFe_2As_2$ compounds and studied different physical properties. Remarkably the competition between the superconducting and the magnetic state leads to the reentrance of superconductivity in the system.

References

- Prof. Zakir Hossain
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Declaration:

I hereby declare that the details stated above are true and correct to the best of my knowledge.