CURRICULUM VITAE

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Educational Qualifications :

Ph. D. in Physics from Delhi University, New Delhi, India (2007)

Master of Science in Physics from Banaras Hindu University, Varanasi, India (1995)

Title of Ph. D. Thesis :

" **Investigations on Structural and Magnetotransport Properties of Layered Manganites** "*

*All the experimental works during Ph.D. has been done at **National Physical Laboratory, New Delhi, India**

Area of Spetialization : Experimental condensed matter physics

Fellowships :

- Research Associate (CSIR funded Project) Dec. 2007 -Oct. 2008
  at **Indian Institute of Technology Delhi, New Delhi**.
- Senior Research Fellow - NET (CSIR, New Delhi) Oct. 2004 – Dec. 2007
  at **National Physical Laboratory, New Delhi**.
- Junior Research Fellow - NET (CSIR, New Delhi) Oct. 2002 – Oct. 2004
  at **National Physical Laboratory, New Delhi**.

Honours /Awards :

- ***Sectional Committee Member*** of ***Materials Science Section*** of Indian Science Congress Association for the year 2006 – 2007
- **Council of scientific and Industrial Research (CSIR) – NET Fellowship** 2002 - 2007

Professional Membership :

Life member of Indian Science Congress Association, India

Research Interests:

Presently my research interest is focused on

- Synthesis and characterization of strongly correlated oxides particularly doped rare earth manganites.
- Study of low temperature transport properties of doped manganites.
- Study of the effect of dimensionality on the low temperature transport properties of doped manganites (infinite layered, single layered and double layered doped manganites).
- Study of conduction noise in doped manganites (it could reveal the information about the mechanism for electrical transport in doped strongly correlated oxides).
- Synthesis of oxide nano particles, nanorods.
- Study of the optical, magnetic and electronic properties of nano materials particularly oxides and correlation between these properties. The study of the temperature dependence of optical properties is very interesting for understanding of the physics in these materials.
- Synthesis of ZnO nano particles, ZnO nanorods, ZnO nano particles-conducting polymer composites and ZnO nanorods, fabrication of ZnO polymer heterojunctions (n-p configuration)
- Study of the transport properties of the ZnO nano particles, ZnO nanorods, ZnO nano particles-conducting polymer composites and ZnO nanorods-conducting polymer hetero structure.
- Study of biomedical applications of ZnO nanorods.

Research Experience :

More than ten years of research experience in the field of experimental Condensed Matter Physics especially in synthesis and characterization of materials. Good knowledge of handling low temperature experimental setups. Ph.D. work was mainly focused on study of transport properties of manganite in the temperature range from 4.1 K to room temperature and results were discussed with proposed models.

Brief Summary of Research Work :

Magnatotransport Studies in double layered $La_{2-2x}Ca_{1+2x}Mn_2O_7$ manganites

Magnetotransport properties of double layered $La_{2-2x}Ca_{1+2x}Mn_2O_7$ (x = 0.0 – 0.5) manganites have been studied and on the basis of these studies, a magnetic phase diagram of double layered $La_{2-2x}Ca_{1+2x}Mn_2O_7$ manganites have been proposed.

The study of temperature dependent magnetoresistance and magnetization of high quality bulk sample of double layered $La_{1.4}Ca_{1.6}Mn_2O_7$ manganite prepared by sol-gel method revealed perfectly polarized magnetic bilayeres. The observed magnetoresistance was attributed to the spin polarized tunneling of charge carriers between these polarized magnetic bilayeres.

Transport mechanism in double layered $La_{2-2x}Ca_{1+2x}Mn_2O_7$ manganites

Transport mechanisms in double layered $La_{2-2x}Ca_{1+2x}Mn_2O_7$ manganites have been studied thoroughly. At low temperatures, the increase of resistivity with decrease in temperature was found to be due to combined effect of weak localization and electron-electron scattering for the compositions x = 0.1 – 0.4. However, the minimum in the resistivity was observed due to competition between the weak localization effect, electron-electron scattering process and electron-phonon scattering process at low temperatures. At high temperature above metal –

insulator transition temperature, the Mott's 3D VRH mechanism was found to be the most suitable transport mechanism describing the semiconducting behaviour of the double layered $La_{2-2x}Ca_{1+2x}Mn_2O_7$ (x = 0.0 – 0.5) manganites. The metal – insulator transition was seemed to be occurring due to magnetic disorder induced percolation in these manganites.

Conduction Noise Studies

The conduction noise in double layered $La_{1.4}Ca_{1.6}Mn_2O_7$ manganite possessed $1/f^{\alpha}$ type of frequency dependence. The study of temperature dependence of normalized conduction noise of the double layered $La_{1.4}Ca_{1.6}Mn_2O_7$ manganite revealed three peaks at different temperatures which correspond to the setting up of two-dimensional short range ferromagnetic correlations, two-dimensional out-of plane ferromagnetic and three-dimensional out-of-plane ferromagnetic ordering respectively in the double layered manganite On the application of magnetic field, conduction noise was found to reduce due to a reduction of spin fluctuations generated at three-dimensional out of plane and two-dimensional short-range ferromagnetic transitions as well as reduction of fluctuations in magnetic domain orientation.

After Ph. D., I worked on various materials viz; manganite, ZnO nanostructures and Polymer composites with ZnO nano particles. Nano particles of ZnO were synthesized by solution technique and composite films of nano ZnO/polyaniline with different weighted percentage were prepared. The dielectric properties of these films have been studied and the explained on the basis of multi-core model. ZnO nanorods have been successfully grown by solvo-thermal method on template and thin films of ZnO were deposited by spray pyrolysis method for various optoelectronic applications. LBMO manganite samples have been synthesized by conventional ceramic method and effect of biasing current on their magnetotransport properties were studied. The results were explained on the basis of two phase model. From the study of conduction noise in double layered manganite, magnetic disorders in the system were attributed to the occurrence of metal insulator transition in the system and magnetic field dependence of conduction noise suggested the percolative type of electrical transport in the system.

Papers Published in International Journals :

1. **Study of magneto-transport in double layered $La_{1.4}Ca_{1.6}Mn_2O_7$ manganite: presence of nano ferromagnetic domains in paramagnetic matrix**
   Ajai K. Gupta, Rajesh Kumar, Vijay Kumar, G. L. Bhalla and Neeraj Khare
   *(Journal of Physics and Chemistry of solids, **70**(117) 2009*.
2. **Synthesis and Characterization of Polyaniline-ZnO Composite and its Dielectric Behaviour**
   Bhupendra Kumar Sharma, **Ajai K. Gupta,** Neeraj Khare, S. K. Dhawan, H. C. Gupta
   *Synthetic Metals,**159**(391)2009.*
3. **Magnetic flux noise in MgB_2 superconductor**
   Neeraj Khare, D. P. Singh and **Ajai K. Gupta**
   *Appl. Phys. Lett., **92** (192508) 2008.*
4. **Current-induced effect on resistivity and magnetoresistance of $La_{0.67}Ba_{0.33}MnO_3$ manganite**
   Rajesh Kumar,**Ajai K. Gupta,** D. P. Singh, Vijay Kumar, Neeraj Khare
   *J. Mag. Mag. Mater., .**320**(2741)2008.*
5. **Temperature dependence of electroresistance for $La_{0.67}Ba_{0.33}MnO_3$ manganite**
   Rajesh Kumar, **Ajai K. Gupta**, G. L. Bhalla, Vijay Kumar, Neeraj Khare

*Journal of Physics and Chemistry of Solids, **68** (2394) 2007.*

6. **Hopping Conduction in double layered $La_{2-2x}Ca_{1+2x}Mn_2O_7$ manganite**
   Ajai K. Gupta, Vijay Kumar, Neeraj Khare
   *Solid State Sciences, **9** (817) 2007.*
7. **Low temperature electrical transport in $La_{2-2x}Ca_{1+2x}Mn_2O_7$ double layered manganite**
   Ajai K. Gupta, Vijay Kumar, G.L. Bhalla and Neeraj Khare
   *Journal of Alloys and Compounds, **438** (56) 2007.*
8. **Temperature and Magnetic Field Dependence of Conduction Noise in Double Layered $La_{1.4}Ca_{1.6}Mn_2O_7$ Manganite**
   Ajai K. Gupta, G. L. Bhalla and Neeraj Khare
   *Fluctuation and Noise Letters, **6** (L387) 2006.*
9. **Magnetic phase diagram of double-layered $La_{2-2x}Ca_{1+2x}Mn_2O_7$ manganite**
   Ajai K. Gupta, G.L. Bhalla and Neeraj Khare
   *Journal of Physics and Chemistry of Solids, **67**(2358**)** 2006.*
10. **Preparation and low field magnetoresistance of double layered manganite $La_{1.4}Ca_{1.6}Mn_2O_7$**
    Neeraj Khare, **Ajai K. Gupta** and G.L. Bhalla
    *Journal of Physics and Chemistry of Solids, **66** (949) 2005.*
11. **Effect of Ba doping on structure and magneto-transport properties of layered manganite $La_{1.4}Ca_{1.6-x}Ba_xMn_2O_7$**
    H.**K**. Singh, **Ajai. K. Gupta**, P.**K**. Siwach and O.N. Srivastava
    *Journal of Magnetism and Magnetic Materials, **292** (483) 2005.*
12. **Low field magnetoresistance and conduction noise in layered manganite $La_{1.4}Ca_{1.6}Mn_2O_7$**
    Neeraj Khare, **Ajai K. Gupta** and G.L. Bhalla
    *Solid State Communications, **132** (799) 2004.*

Papers in Conferences /Symposium :

1. **Study of magnetotransport in double layered $La_{1.4}Ca_{1.6}Mn_2O_7$ manganite: presence of nano ferromagnetic domains in paramagnetic matrix**
   Ajai K. Gupta, Vijay Kumar, G. L. Bhalla and Neeraj Khare
   International Workshop on Advanced Materials and Technologies for Nano and Oxide Electronics (AMTNOE 2007), India Habitat Centre, New Delhi, India, Feb 19 - 22, 2007.

2. **Low Temperature Transport Properties of Double Layered $La_{1.4}Ca_{1.6}Mn_2O_7$ Manganite**
   Ajai K. Gupta, Vijay Kumar, G. L. Bhalla and Neeraj Khare
   Twenty First National Symposium on Cryogenics, National Physical Laboratory, New Delhi. 22-24 November 2006.

3. **Effect of Ca doping on transport properties of double layered manganite $La_{2-2x}Ca_{1+2x}Mn_2O_7$**
   Ajai K. Gupta, Rajesh Kumar and Neeraj Khare
   92nd Indian Science Congress, Ahmedabad, 3-7 January,2005.

4. **Magnetotransport in double layered manganite $La_{1.4}Ca_{1.6}Mn_2O_7$**
   Ajai K. Gupta, Neeraj Khare, G. L. Bhalla

Presented at 92nd Indian Science Congress, Ahmedabad, 3-7 January, 2005.

5. **Low field magnetoresistance of $La_{0.67}Ba_{0.33}MnO_3$/ Polymer composites**

   Neeraj Khare, D. P. Singh, **Ajai K. Gupta** and P. K. Singh

   Presented in International Conference on Electroactive Polymers at Dalhousi (H. P.), 1-5 November 2004.

6. **Temperature dependence of resistivity, susceptibility and low field magnetoresistance of double layered $La_{1.4}Ca_{1.6}Mn_2O_7$ manganite**

   Ajai K. Gupta, Neeraj Khare, G. L. Bhalla, A. K. Gupta

   Metrology and Low Temperature Physics, National Physical Laboratory, New Delhi. 20-21 Feb 2004.

7. **Study of low field magnetoresistance of double layered $La_{1.4}Ca_{1.6}Mn_2O_7$ manganite**

   Neeraj Khare, **Ajai K. Gupta**, G. L. Bhalla, A. K. Gupta

   15th AGM-MRSI at BHU, Varanasi. 8-11 Feb 2004.

8. **Low field magnetoresistance in layered perovskite $La_{2-2x}Ca_{1+2x}Mn_2O_7$**

   Ajai K. Gupta, H.K. Singh, D. P. Singh, Neeraj Khare and A. K. Gupta

   National Seminar on Materials and its Applications, Dr.R.M.L. Avadh University, Faizabad on Feb 27-28, 2003.

Participation in Conferences/ Symposiums/Workshop :

1. **Recent Trends in Materials and Devices (RTMD- 2010)**
   Amity University, Noida (U.P.), 20th to 22nd May, 2010.
2. **Indo-Australian Solar Energy Workshop**
   Amity University, Noida (U.P.), 09th- 10th February, 2010.