CV

JAVED IQBAL

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OBJECTIVE

I am a highly motivated individual Nanomaterials Physicist who is interested to work with a research organization or institution, where I can utilize my skills, knowledge, and experience. I enjoy working with a cutting edge research team to explore my capabilities.

RESEARCH PROFILE

Extensive research experience in the synthesis, characterization and in-depth analysis of Dilute Magnetic Semiconducting Oxide **thinfilms** and **nanomaterials** specifically targeting on their room temperature ferromagnetism with high T_c as well as their transparency and including focus on spintronics applications, solar cells, solid state & magnetic gas sensors and quantum computing.

EDUCATION

- **Ph. D** Nanophysics and Material Science *(Spintronics)*; June, 2007- May 2010
  Department of Material Science Tsinghua University Beijing, China
- **M. Phil** Physics *(Nano-magnetism)*; March, 2005 - March, 2007
  Department of Physics Quaid-i-Azam University Islamabad, Pakistan
- **M. Sc** Physics; February, 2003 - February, 2005
  Department of Physics Quaid-i-Azam University Islamabad, Pakistan

LANGUAGES

Urdu, English, Chinese

AWARDS AND HONORS

- **Highest Research Award** 2008-2009 for Ph.D scholars in MSE on basis of publications impact factors, Tsinghua University
- **Talent Award** 2003-04 for Master Level, Higher Education Commission, Pakistan.

- **Overseas Scholarship** 2007-10 for Ph. D in Tsinghua University, Beijing China from Higher Education Commission, Pakistan.
- **3rd position** Award 2003-05 in M. Sc, Quaid-i-Azam University, Islamabad.
- **2nd position** in course work scholarship Award 2006-2007 in M. Phil, Quaid-i-Azam University, Islamabad.
- **1st position** in Bachelor of Science (2002) , Govt. College Sargodha
- **2nd position** (1998) in Govt. High School Noor Pur Thal, Khushab
- **Throughout Ist divisions** in academics career **(Matric, F.Sc, B.Sc, M.Sc, M.Phil & Ph.D**)

SKILLS

Characterization Tools

- Extensive knowledge in characterizing and analyzing semiconductor and magnetic thinfilms and nanostructured materials
- **Structural and Physical Properties:**
  1. X-ray Diffractometer (XRD)
  2. Transmission Electron Microscope (TEM) including HRTEM and SAED
  3. X-ray Photoelectron Spectroscopy (XPS)
  4. Scan Electron Microscopy(SEM)
  5. Atomic Force Microscopy(AFM)
  6. XANES & XAFS (Accelerator of Beijing National-Synchrotron-Radiation-Center)
- **Spectral Techniques:**
  1. Raman Spectroscope
  2. UV-vis-NIR Spectrophotometer
  3. FTIR Spectrometer
- **Magnetic Measurements:**
  1. Superconducting Quantum Design interference Device (SQUID)
  2. Vibrating Sample Magnetometer (VSM)
- **Electronic Properties :**
  1. Capacitance-Voltage Unit
  2. Cyclic Voltammetry
  3. Gas Sensor Systems

Materials Synthesis

- **Thinfilms fabrication**
  - ***Radio Frequency Magnetron Sputtering***

Have an experience to work on DC Radio frequency (RF) magnetron sputtering system. RF sputtering is used to deposit insulating, conducting or semiconductor materials. The RF system is equipped with a specially designed substrate holder which rotates the sample at an angle, around the three magnetrons placed symmetrically around the inside of the vacuum chamber. This allows for very uniform depositions over a substrate surface.

✧ ***Electron Beam Evaporation***

Have an experience to use this technique for deposition of films, in which a high power focused electron beam is used over the target material to heat it up. This allows higher melting point metals such as Ti, Cr and Pt to be deposited in Ultrahigh Vacuum (UHV). The system has a sliding target holder, which enables up to four different materials to be loaded and deposited without breaking the vacuum. The interaction of the electron beam with the target causes the evaporated material to have more kinetic energy. This allows atoms of the first deposited layer to penetrate the semiconductor material slightly, improving the metal-semiconductor contact with good ohmic properties.

■ **Nanoparticles, Nanorods and Nanowires fabrication**

✧ Developed a wide range of spintronics nanostructured semiconducting ZnO and SnO_2 Nanoparticles, Nanorods and Nanowires using high pressure at low temperature chemical solution method.

✧ Fabrication of Nanowires and Nanorods by Chemical Vapor Deposition (CVD).

✧ Co-precipitation approach for the fabrication of Nanoparticles.

✧ Electrochemical deposition fabrication of Nanowires and Nanotubes.

Simulation skills

✧ The simulation of XANES and EXSAF using full multiple-scattering (MS) theory with ab initio self-consistent free energy force FEFF Code 8.2

✧ At initial stages of learning simulation for material characterization using VASP.

RESEARCH AND PROFESSIONAL EXPERIENCE

☞ **Project: National Science Foundation China 973 and China Ministry of Science Projects for Nanoscience and Nanotechnology**

August 2007- 2010 as a Ph. D Scholar in Material Science and Engineering Department Tsinghua University Beijing and as a visiting scholar in School of Physics, Peking University Beijing, China

☞ **Project: Synthesis and Characterization of Magnetic Nanostructured by Higher Education Commission (HEC) Pakistan**

February, 2005-2007 as a research student in Superconductivity & Nanomagnetism Laboratory, Department of Physics Quaid-i-Azam University Islamabad, Pakistan.

CURRENT RESEACRCH

Indeed, the spin of the electron has attracted renewed interest recently because it promises a wide variety of new devices that combine logic, storage and sensor applications. Moreover, these "spintronic" devices might lead to quantum computers and quantum communication based on electronic solid-state devices, thus changing the perspective of information technology in the 21st century. Dilute magnetic semiconductors (DMSs) have drawn considerable attention due to their potential for use in spintronics. For the most part, they are formed by partial replacement of cations in semiconductors by magnetic transition metal ions.

At the present time, there are many conflicting results concerning room temperature ferromagnetism of $Zn_{1-x}TM_xO$ samples fabricated by different methods. Furthermore, it is not clear whether these Transition Metals (TM) doped ZnO samples are really semiconductor alloys (where the alloy itself is ferromagnetic) or represent a paramagnetic-ferromagnetic composite mixture consisting of a paramagnetic $Zn_{1-x}TM_xO$ matrix with unidentified tiny ferromagnetic cluster. My work plan is also to clarify these points and establish an understanding of the interplay of the various microscopic mechanisms behind the macroscopically observed magnetism of the (Zn, TM) O systems. Only if the origin of the ferromagnetism is understood and correlated with the structural properties, it will be possible to estimate the potential of this material for devices and to optimize the magnetic properties towards applications in a controlled and efficient way. As ZnO is wide gap semiconductors so with room temperature ferromagnetism its optical inherent properties can also be further extended to novel applications for optoelectronics devices.

Currently, I am extensively working on the synthesis of TM (Ni, Co etc) doped ZnO, and TM doped SnO_2 Thinfilms, Nanoparticles, Nanorods and Nanowires, and on their magnetic, optical and transport properties measurements using different techniques. By using lithography technique in highly vacuum environment, magneto resistance (MR) and IV characteristics for single dilute magnetic semiconductors nanowires is also field of interest. Besides this, my interest is also to do some work related to the fabrication of devices, especially magneto tunneling junction (MTJ), ZnO based LEDs and spin FET.

List of Publications

1. Huichao Zhu, **Javed Iqbal**, Hongjun Xu, Dapeng Yu, Raman and photoluminescence properties of highly Cu doped ZnO nanowires fabricated by vapor-liquid-solid process, ***The Journal of Chemical Physics*** 129, 124713 (2008).

2. **Javed Iqbal** , Xiaofang Liu , Huichao Zhu, Z.B. Wu, Yong Zhang, Dapeng Yu, Ronghai Yu, Raman and highly ultraviolet red-shifted near band-edge properties of LaCe-co-doped ZnO nanoparticles, ***Acta Materialia*** 57, 4790-4796 (2009).

3. X. F. Liu, **Javed Iqbal**, W. M. Gong, S. L. Yang, R. S. Gao, F. Zeng, R. H. Yu, B. He, Y. P. Hao, X. P. Hao, Correlation between donor defects and ferromagnetism in insulating $Sn_{1-x}Co_xO_2$ films, ***Journal of Applied Physics*** 105,093931 (2009).

4. **Javed Iqbal**, Baiqi Wang, Xiaofang Liu, Dapeng Yu, B. He, Ronghai Yu, Oxygen-vacancy-induced green emission and room-temperature ferromagnetism in Ni-doped ZnO nanorods, ***New Journal of Physics*** 11, 063009 (2009).

5. **Javed Iqbal,** Wang Baiqi, Xiaofang Liu, Zhu Huichao, Yu Dapeng, Yu Ronghai, Role of sp-d exchange interactions in room-temperature photoluminescence and ferromagnetism of CuCo co-doped ZnO nanorods, ***Journal of Nanoscience and Nanotechnology*** 9, 6823-6827 (2009).

6. Mashkoor Ahmad, Jiong Zhao, **Javed Iqbal**, Wei Miao, Lin Xie, Rigen Mo, Jing Zhu, Conductivity enhancement by slight indium doping in ZnO nanowires for optoelectronic applications, ***Journal of Physics D: Applied Physics*** 42, 165406 (2009) .

7. B. Wang, **Javed Iqbal**, X. Shan, G. Huang, H. Fu, Ronghai Yu, Dapeng Yu, Effects of Cr-doping on the photoluminescence and ferromagnetism at room temperature in ZnO nanomaterials prepared by soft chemistry route**,** ***Materials Chemistry and Physics*** 113, 103 (2009).

8. X. F. Liu, W.M. Gong, **Javed Iqbal**, B. He, R. H. Yu, Structural defects-mediated room-temperature ferromagnetism in Co-doped SnO_2 insulating films, ***Thin Solid Films*** 517 6091-6095 (2009).

9. **Javed Iqbal**, Xiaofang Liu, Abdul Majid, Dapeng Yu, Ronghai Yu, Narrowing of bandgap and low temperature spin glass behavior of FeNi co-doped ZnO nanowires, ***Europhysics Letter (EPL)*** 87, 57004 (2009).

10. Takashi Harumoto**,** **Javed Iqbal**, Xiaofang Liu, Ji Shi, Yoshio Nakamura, Ronghai Yu, Effects of hydroxyls on the structural and room temperature ferromagnetic properties of Co doped SnO_2 nanoparticles, ***Applied Physics A*** 97, 211-215 (2009).

11. Wang Baiqi, Chunhui Xia, **Javed Iqbal** , Naijun Tang, Zengrong Sun, Yan Lv, Lina Wu, Influences of Co doping on the structural, optical and magnetic properties of ZnO nanorods synthesized by hydrothermal route, ***Solid State Sciences*** 11, 1419 (2009).

12. Wang Baiqi, Shan Xudong, Fu Qiang **Javed Iqbal**, Yan Lv, Fu Honggang, Dapeng Yu, Photoluminescence properties of Co-doped ZnO nanorods array fabricated by the solution method, ***Physica E*** 41, 413-417 (2009).

13. **Javed Iqbal**, Xiaofang Liu, Huichao Zhu, Chongchao Pan, Yong Zhang, Dapeng Yu, Ronghai Yu, Trapping of Ce electrons in band gap and room temperature ferromagnetism of Ce^{4+} doped ZnO nanowires, ***Journal of Applied Physics,***106 , 83515(2009).

14. Mashkoor Ahmad , Caofeng Pan, **Javed Iqbal**, Lin Gan, Jing Zhu, Bulk synthesis route of the oriented arrays of tip-shape ZnO nanowires and an investigation of their sensing capabilities, ***Chemical Physics Letters,*** **480**, 105-109 (2009).

15. **Javed Iqbal**, Xiaofang Liu, Naeem Ahmad, Takashi Harumoto, Dapeng Yu, Ronghai Yu, Room-temperature spin glass and near band edge (NBE) properties of highly disorder $(FeCo)_{0.03}Zn_{0.97}O$ and $(FeCoNi)_{0.03}Zn_{0.97}O$ nanorods, ***Journal of Applied Physics,*** in press (2009).

16. Xiaofang Liu, **Javed Iqbal**, B. He, Ronghai Yu, Structure and room-temperature ferromagnetism in nonmagnetic Zn-doped SnO_2 nanorods, ***Journal of Physical Chemistry C,*** accepted ***(***2009).

17. Mashkoor Ahmad , Caofeng Pan, Jiong Zhao, **Javed Iqbal**, Jing Zhu, Electron irradiation effect and photoluminescence properties of ZnO-tetrapod nanostructures, ***Materials Chemistry and Physics*** , in press (2009).

18. Chong Chao Pan, W. P. Cai, **Javed Iqbal**, Z. Wang, C. Q. Geng, Ronghai Yu, Microstructure and electrochemical properties of melt-spun $Nd_{0.8}Mg_{0.2}(Ni_{0.8}Co_{0.2})_{3.8}$ hydrogen storage alloy, ***Journal of Rare Earths,*** accepted (2009).

19. **Javed Iqbal**, Xiaofang Liu, Mashkoor Ahmad, Yong Zhang, Dapeng Yu, Ronghai Yu, Doping induced tailoring in morphology, optical band gap and ferromagnetism of Fe doped ZnO Nanoparticles, Nanorods and Nanowires, Submitted to ***NanoLetter*** (2009).

REFERENCES

- ✓ **Prof. Dr. Yu Dapeng**

  School of Physics, Peking University Beijing, China

- ✓ **Prof. Dr. Yu Ronghai**

  Department of Material Science and Engineering, Tsinghua University Beijing, China

- ✓ **Prof. Carsten Timm**

  Department of Physics and Astronomy, University of Kansas, USA

- ✓ **Prof. Yong Zhang**

  Center for Material Science and Engineering, Massachusetts Institute of Technology (MIT), Cambridge, USA