Mahak Khandelwal

B.Tech. Ceramic Engineering
Institute of Technology
Banaras Hindu University
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Sections:

CURRICULUM VITAE
MAHAK KHANDELWAL
Date of Birth: 14th February '1984

SUMMARY:

- Fields of Interests:
  - Ferro-electrics, High Dielectric constant materials, Opto-electronic materials – Compound Semiconductors, Low Dimensional Quantum Heterostructures and their properties.
  - Advance Characterization Techniques.
- Interdisciplinary work (Physics, Electrical Engineering and Material sciences) instilled in an excellent foundation of the subject fundamentals and gave an opportunity for work at premier Indian Research Institutions.

EDUCATION:

- B.Tech. Ceramic Engineering at Institute of Technology, Banaras Hindu University (May'2006).

ACHIEVEMENTS:

- Qualified IIT Joint Entrance Examination (2002) (Percentile - 99.88).
- GRE score 1500/1600
  (Quantitative: 800/800, Verbal: 700/800, Analytical: 4.00/6.00)
- TOEFL score: 273
  (Listening; 28/30; Structure/Writing: 28/30; Reading: 26/30; Essay: 5.5/6.0).
- ***Departmental Rank: 2*** out of 26 undergraduate students up to semester VI.
  Applying Rank :1
- Cumulative Grade Point Average (Absolute grading):
  - Overall: 8.4 / 10.00
  - Ceramic Majors: 8.78 / 10.00
- Computer Skills:
  - Operating System: Linux, UNIX, Windows 2000/2003.
  - Programming Languages: C, C++, and Matlab.
  - Software packages: Matlab toolboxes, Origin, Mathematica, various softwares for optical spectrophotometers and XRD's.

AWARDS & FELLOWSHIPS:

- ***Excellence in Academic performance*** in 2004 at IT BHU.
- ***Excellence in Academic performance*** in 2005 at IT BHU (to be awarded on IT Day'2006).
- ***BHU Merit Scholarship*** for excellence in academic performance. This is granted to the top 2 rankers of the department.
- ***'Fellow'*** for ***Visiting Students Research Program'2005*** at Tata Institute of Fundamental Research, Mumbai. 50 students from India among all Science and Engineering applicants are selected every year for this program on the basis of previous research work and academics.
- ***IT COLOR*** award for all round achievements (Music, Literary, Academics).

RESEARCH SUMMARY:

Dielectric properties of Co doped Ca Cu_3 Ti_4 O_{12} (Ca Cu_3 Ti_3 Co O_{12}): August'2005
Ongoing B. Tech Project; Prof. Om Parkash, Electronic Ceramics Lab,
Department of Ceramic Engineering, I.T., B.H.U.

- Fabrication of Co Doped $Ca_3Cu_3Ti_4O_{12}$ by conventional Ceramic route method. This had enhanced dielectric properties (High dielectric constant) for applications in capacitors.
- Complete characterization of the new High K dielectric material (XRD, Dielectric properties, Impedance Spectroscopy etc.).

Fabrication of Quantum Dots : May'2005 - July'2005

Prof. B.M. Arora and Dr. Arnab Bhattacharaya, Solid State Electronics Group,

Department of Condensed Matter Physics and Material Sciences, Tata Institute of Fundamental Research - Mumbai.

- For applications in DFB/DBR lasers, fabricated orthogonal gratings on GaAs substrates by interferometric lithography which was a mask less technique for the fabrication of such structures (period of the grating ~2000Å and could be easily tuned).
- The same was used to obtain Quantum Dots on GaAs/AlGaAs structures that were uniform over an area of 4 mm^2. These were then characterized by Photoluminescence spectroscopy and XRD.

Optical Characterization of Quantum heterostructures: May'2004 – July'2004

Prof. S.B. Krupanidhi, MOCVD group, Department Chair.

Material Research Center, Indian Institute of Sciences, Bangalore

- With the view of further working on heterostructures embedded with quantum dots, worked on characterization of MOCVD grown Quantum Well Infrared Photo detectors (multiple QW-GaAs/AlGaAs); optical characterization primarily through Low Temperature Photoluminescence with some Photo response spectroscopy; I-V characteristics and dark current measurements.
- Calculated for relaxation time of holes, and excitons; the inter-band and inter sub-band energy measurements to find the mathematical relation between the composition and these parameters.

Infra Red Detectors: Sept'2003 - Sept'2004

Professor P.Chakrobarty, Optoelectronics research group,

Department of Electronics Engineering, I.T., B.H.U.

- To obtain the IR detector response characteristics, worked on determination of absorption coefficient variation of $Hg_xCd_{1-x}Te$ with composition.
- Theoretically found the α(absorption coefficient) - x and α - E (Band gap energy) relationship.
- The band tails and the above band gap regions successfully represented as (extended) Urbach and Hyperbolic respectively on the graph. The hyperbolic parameters had shown deviation hence, work on the above band gap regions is still in progress.

Ion Conducting Polymer electrolyte films: Mar'2004 - Oct'2004

Professor S. Chandra, (Emeritus Scientist, Former Dean) Solid State ionics Lab,

Department of Physics, BHU:

- Solid state electrolytes are important for batteries. With a view to achieve better conductivity of electrolyte, work was carried out to fabricate dispersed polymeric films.
- Deposition of ion conducting polymeric thin films dispersed by insulating filler. These films have higher mechanical strength and better ionic conductivity (polycrystalline materials) .We prepared polymer electrolyte PEO complexed and dispersed with varying substances. A paper has been submitted for this work.
- Complete characterization of the films including IR Spectroscopy, SEM, TEM, XRD, and Sinter ability.

Synthesis of ferroelectrics ceramics (Sr^{2+} modified $BaTiO_3$): Jan'2004 - Sept'2004
Professor S. Chandra, (Emeritus Scientist, Former Dean) Solid State ionics Lab,
Department of Physics, BHU:

- Preparation of Ferro electric Sr^{2+} doped $BaTiO_3$ using novel semi wet route for its dielectric properties.
- Samples were found to be much more homogeneous than the samples prepared using the conventional solid-state route. Advantage of this route is that we have been able to reduce the calcinations and sintering temperatures.
- Characterizations done; XRD, Dielectric measurements etc. Variation of dielectric constant with temperature was observed. , observation of relaxation dipolar freezing below the hump temperature was made and explained.

Ferro-electric Polymer composite: Aug'2003 - Feb'2004
Professor S. Chandra, (Emeritus Scientist, Former Dean) Solid State ionics Lab,
Department of Physics, BHU:

- Role of the dielectric constant of ferroelectric ceramic in enhancing the ionic conductivity of a polymer electrolyte composite was found.
- The effect of dispersal of ferroelectric ceramic materials $BaTiO_3$ (various compositions) on the ionic conductivity of an ion conducting polymer electrolyte (PEO: NH_4I) was also observed.

ACQUIRED SKILLS:

By virtue of the above projects, Besides fabrication, I am acquainted with the following characterization techniques:

- Photoluminescence Setup, MOCVD Technique, wet chemical etching, Lithography.
- Hall Effect for resistivity, Impedance Spectroscopy.
- SEM and TEM
- Atomic Force Microscopy
- X-ray Diffraction
- Differential Thermal and Thermo gravimetric Analysis
- Optical Microscopy
- Polarization and Piezo-electric constant measurements

PUBLICATIONS & REPORTS:

- "Low temperature PL study of (GaAs/AlGaAs) QWIP structure" M. Thirumavalavan, S. Tripathy, Sameer Shah, Sundararajan B, A.T. Kalghatgi, and S.B. Krupanidhi; Acknowledgements: ***Mahak Khandelwal***. http://eel.iust.ac.ir/Sadr/Papers/omd6.5.pdf
- S.B. Rai, Pramod K. Singh, Kaushal Kumar, ***M. Khandelwal***, Neelam Srivastava, S. Chandra "Dependence of ionic conductivity and diffusivity on the concentration of dispersed insulating fillers in polymer electrolytes" - Presented in an international conference on 'Ion conducting ElectroactivePolymers'-ICEP'2004 and further communicated for publication in ICEP proceedings.
- ***Mahak Khandelwa***l: Project Report "Fabrication of 1-D / 2-D gratings and Quantum dots by Holographic Interferometry".
- ***Mahak Khandelwal***: Project Report "Low Temperature excitonic transitions of QWIPs ($Ga_x As_{1-x}$/ $Ga_x Al_{1-x}As$ heterostructures) Structures".

TEACHING EXPERIENCE & PRESENTATIONS:

- Presented a seminar at the Tata Institute of Fundamental Sciences on "The fabrication of 1D/2D gratings by holographic interferometry"(2005).
- Presented a seminar at an MRSI conference (Thiruvananthpuram) on "The excitonic transitions of the QWIPS by low temperature Photoluminescence"(2004).
- Presented seminar on "Ferroelectric materials and their applications" in the department. (2005).
- Conducted 5 workshops for juniors on "Fundamentals of Material Science and Electronic Materials" followed by Quiz sessions (2004-2005).
- Delivered lecture for juniors on "Brief Introduction of Various kinds of Materials and scope of their research" for IEEE SPAVes'2005 .Elected by the IEEE team of the Institute.

REFERENCES:

- Dr. S.Chandra, Professor, Emeritus Scientist (CSIR) , Former Dean, Department of Physics, BHU, Varanasi, India.(schandra@bhu.ac.in); Fax:+91-542-317074.
- Dr. O. Parkash, Professor, Department of Ceramic Engineering, IT, BHU, Varanasi, India. (opec_itbhu2003@yahoo.co.in);Phone: +91-542-2307043
- Dr. S. B. Krupanidhi, Chairman, Material Research Centre, Indian Institute of Sciences, Bangalore (sbk@mrc.iisc.ernet.in):Phone: +91-080-2360 1330
- Dr. B.M. Arora, Professor, Dept. of Condensed Matter Physics and Material Sciences, Tata Institute Of Fundamental Research, Mumbai (brij@tifr.res.in):Phone:+91-22-22802261
- Dr. Arnab Bhattacharya, Dept. of Condensed Matter Physics and Material Sciences, Tata Institute of Fundamental Research, Mumbai (arnab@tifr.res.in): Phone:+91-22-22802261

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For updates in my profile, documents, activities, important reports and certificate copies please consult my webpage http://www.freewebs.com/mahak/