

## **CURRICULUM VITAE (CV)**

**Name: Khushboo Agarwal**

Mobile no. 9999808850

Email id: khushbooagal@gmail.com

Date of Birth: 18th May 1987

### **Research positions**

2017- Till date: Indian Institute of Technology-Delhi, India

Worked as a postdoctoral fellow in a joint collaborative project between Bio-Nano Electronics Research Centre (BNERC), Toyo University Japan and Indian Institute of Technology-Delhi, India. Currently engaged in performing X-ray Photoelectron Microscopy (XPS) measurements and synthesis of metal nanoparticles for plasmonic applications.

### **Education**

2011-2017: Ph.D., Indian Institute of Technology Delhi, India

Ph.D. Supervisors- Prof B. R. Mehta (IIT-Delhi, India) & Prof. J. Brugger (EPFL, Laussane, Switzerland)

2009-2011: Research Associate, National Physical Lab, Delhi, India

2007-2009: MSc. Physics (Electronics), University of Delhi, India

2004-2007: BSc. (H) Physics, University of Delhi, India

### **Research Interest**

Synthesis of organic, inorganic and 2D thin films and nanocomposites, electrical and thermal characterizations, nanoscale measurements, p-n junctions, organic-inorganic hybrid structures, interfacial properties, grain structure, solar cells, thermoelectric measurements techniques, high resolution transmission electron microscopy, conductive atomic force microscopy, kelvin probe force microscopy, scanning thermal microscopy, X-ray photoelectron microscopy.

### **Technical Skills**

#### ***Deposition techniques***

Thermal evaporation, DC and RF magnetron sputtering, electrochemical deposition, solvothermal and chemical bath techniques.

#### ***Characterization techniques***

X-ray diffraction and X-ray photoelectron spectroscopy for structural analysis, Spectroscopic ellipsometry and UV-Vis-NIR for optical studies, two and four probe I-V using probe station for electrical studies, resistivity vs temperature, capacitance-voltage measurements, conductive atomic force microscope, kelvin probe force microscope and scanning thermal microscopy for nanoscale electrical and thermal studies, Seebeck effect measurement, photovoltaic response, frequency response analysis, cyclic voltammetry.

#### ***Device Testing***

Electrical and thermal measurement for thermoelectric and solar cell applications at macroscale and nanoscale level.

## ***Programming Languages***

C/C++ and labview programming for interfacing

## **Research Experience**

- Synthesis of thin film of polymers and various inorganic compounds using electrochemical deposition, RF magnetron sputtering and thermal evaporation systems.
- Synthesis of 2D thin films (graphene, MoS<sub>2</sub>, Bi<sub>2</sub>Te<sub>3</sub>) using CVD, MOCVD and solvothermal methods.
- Fabrication and electrical characterization Bi<sub>2</sub>Te<sub>3</sub> based nanocomposite structures with various 2-D as well as bulk materials for thermoelectric measurements.
- Understanding of the role of interface modification of nanocomposite structures and its charge transport on thermoelectric applications.
- Enhancement in figure of merit of Bi<sub>2</sub>Te<sub>3</sub> nanocomposites (ZT ~ 1.45) as compared to ZT for Bi<sub>2</sub>Te<sub>3</sub> (~ 0.40).
- Developed a new technique for measuring thermal conductivity of thin films based on modified Parker's method using commercial SThM.
- Understanding the reaction kinematics and equivalent circuits involved in electrochemical synthesis for doped polymers.
- Transport studies for disordered system on the basis of Mott's VRH model and Mott's parameters for polymer systems.

## **Honors & Awards**

- NET-UGC fellowship granted by Council for Scientific and Industrial Research (CSIR), Govt. of India for doctoral research work (2010-2015)
- Qualified Graduate Aptitude Test in Engineering (Physics) 2010 with a percentile of 98.4.
- Best oral presentation at Delhi Technical University (DTU) (2011)
- Best poster presentation at National Physical Laboratory (NPL), on science day (2011).

## **Publications**

1. D. Sharma, N. Kamboj, **K. Agarwal** and B. R. Mehta. Structural, optical and photoelectrochemical properties of phase pure SnS and SnS<sub>2</sub> thin films prepared by vacuum evaporation method, Journal of Alloys and compounds, 822, 153653 (2020).
2. M. Vishwakarma, **K. Agrawal** and B. R. Mehta. Investigating the effect of sulphurization on volatility of compositions in Cu-poor and Sn-rich CZTS thin films, Applied Surface Science, 507, 145043 (2020).
3. N. Kodan, **K. Agarwal** and B. R. Mehta. All-Oxide  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>/H:TiO<sub>2</sub> Heterojunction Photoanode: A Platform for Stable and Enhanced Photoelectrochemical Performance through Favorable Band Edge Alignment, Journal of Physical Chemistry: C, 126, 3326 (2019).
4. **K. Agarwal**, D. Varandani and B. R. Mehta. Simultaneous Enhancement of Electron Transport and Phonon Scattering in Bi<sub>2</sub>Te<sub>3</sub>: Si Nanocomposites: Role of a Conducting Secondary Phase, Journal of Alloys and compounds, 698, 1058 (2017).
5. M. Ahmad, **K. Agarwal**, N. Kumari, B. R. Mehta. KPFM based investigation on the nature of Sb<sub>2</sub>Te<sub>3</sub>:MoS<sub>2</sub> and Bi<sub>2</sub>Te<sub>3</sub>:MoS<sub>2</sub> 2D interfaces and its effect on the electrical and thermoelectric applications, Applied Physics Letters, 111, 023904 (2017)

6. **K. Agarwal**, V. Kaushik, D. Varandani, A. Dhar and B. R. Mehta. Nanoscale Thermoelectric Properties of Bi<sub>2</sub>Te<sub>3</sub>- Graphene Nanocomposites: Conducting Atomic Force, Scanning Thermal and Kelvin Probe Microscopic Studies, Journal of Alloys and Compounds, 681, 394 (2016).
7. D. Varandani, **K. Agarwal**, J. Brugger and B. R. Mehta. Scanning thermal microscope based method for the determination of thermal diffusivity of nanocomposite thin films, Review of Scientific Instruments 87, 084903 (2016).
8. **K. Agarwal**, R. Sharma and B. R. Mehta. Synthesis and Characterization of Bi<sub>2</sub>Te<sub>3</sub> Nanostructured Thin Films, Journal of Nanoscience and Nanotechnology 15, 2882 (2015).
9. **K. Agarwal** and B. R. Mehta, Structural, electrical, and thermoelectric properties of bismuth telluride: Silicon/carbon nanocomposites thin films, Journal of Applied Physics, 116, 083518 (2014).
10. R. K. Singh, A. Kumar, **K. Agarwal**, H. K. Singh, P. Srivastava and R. Singh. Effect of ptoluenesulfonate on inhibition of overoxidation of polypyrrole, Journal of Applied Polymer Science 130, 432 (2013).
11. R. K. Singh, A. Kumar, **K. Agarwal**, M. Kumar, H. K. Singh, P. Srivastava and R. Singh. DC electrical conduction and morphological behavior of counter anion-governed genesis of electrochemically synthesized polypyrrole films Journal of Polymer Science Part B: Polymer Physics, 50, 347 (2012).
12. R. K. Singh, A. Kumar, **K. Agarwal**, D. Dwivedi, K. N. Sood and R. Singh. Influence of Binary Oxidant (FeCl<sub>3</sub>:APS) Ratio on the Spectroscopic and Microscopic Properties of Poly(2,5Dimethoxyaniline), Open Journal of Polymer Chemistry, 2, 105 (2012).

## Conferences

1. **K. Agarwal** and B. R. Mehta, Synthesis and characterization of Bi<sub>2</sub>Te<sub>3</sub> nanocomposites for thermoelectric applications, Poster presented at ICONSAT (2014), Chandigarh, India
2. **K. Agarwal** and B. R. Mehta, Effect of silicon, carbon and tellurium on structural, electrical and thermoelectric properties of bismuth telluride nanocomposites thin films, Poster presented at MRS Fall Meeting & Exhibit (2014), Boston, MA.
3. **K. Agarwal** and B. R. Mehta, Nanocomposites thin films for improved thermoelectric properties, Poster presented at 2nd Indo-US workshop (2014), NPL, India
4. **K. Agarwal**, V. Kausik, D. Varandani and B. R. Mehta, Structural, electrical and thermoelectric transport of bulk Bi<sub>2</sub>Te<sub>3</sub> composite samples with graphene and carbon, Oral presentation at NCSMD (2016), IIT-Jodhpur, India
5. **K. Agarwal**, D. Varandani and B. R. Mehta, Nanoscopic and macroscopic study of the effect of carbon and silicon on structural, electrical and thermoelectric properties of bismuth telluride thin films, Poster presentation at NCSMD (2016), IIT-Jodhpur, India

## References

Prof B. R. Mehta  
Department of Physics  
Indian Institute of Technology-Delhi  
Hauz Khas  
New Delhi  
Email-id: [brmehta@physics.iitd.ac.in](mailto:brmehta@physics.iitd.ac.in)

Prof Juergen Brugger  
EPFL STI IMT LMIS1  
BM 3107  
CH-1015 Lausanne  
Switzerland  
Email-id: [juergen.bugger@epfl.ch](mailto:juergen.bugger@epfl.ch)

Prof Joby Joseph  
Department of Physics  
Indian Institute of Technology-Delhi  
Hauz Khas  
New Delhi  
Email-id: [joby@physics.iitd.ac.in](mailto:joby@physics.iitd.ac.in)

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