

Dr. SHAHAB AHMAD

Assistant Professor
Centre for Nanoscience and Nanotechnology,
Jamia Millia Islamia (Central University),
New Delhi-110 025, India.

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ACADEMICS

Ph.D. Physics (July 2010-2014): Department of Physics, Indian Institute of Technology Delhi, New Delhi-India (www.iitd.ac.in)

M.Tech. (Nanotechnology) (2008-2010): Department of Applied Physics, Aligarh Muslim University, Aligarh, UP, India (www.amu.ac.in)

M.Sc. (Physics) (2006-2008): Department of Physics, Aligarh Muslim University, India (www.amu.ac.in)

EXPERIENCE (After PhD Thesis Submission)

Assistant Professor (30th June 2017- Till present, *Permanent*)
Centre for Nanoscience and Nanotechnology, **Jamia Millia Islamia (Central University)**, New Delhi, India. (<https://www.jmi.ac.in/cnn>)

Research Associate (3rd Nov 2014- 30th June 2017) ~ 2 years and 8 months
Research Area: *Energy Storage and Optoelectronic Devices*
Supervisor: Dr. Michael De Volder, NanoManufacturing Lab, Institute for Manufacturing, Department of Engineering, **University of Cambridge**, UK. (www.nanomanufacturing.eng.cam.ac.uk)

Project Associate (19th Aug 2014-2nd Nov 2014) ~ 2.5 months
Supervisor: Prof. G. Vijaya Prakash, Nanophotonics Lab, Department of Physics, **Indian Institute of Technology Delhi**, New Delhi-India. (www.iitd.ac.in)

Visiting Scientist (18th May 2014-17th Aug 2014) ~ 3 months
Host: Prof. Jeremy J. Baumberg (FRS), Nanophotonics Centre, Cavendish Laboratory, Department of Physics, **University of Cambridge**, UK. (<http://www.np.phy.cam.ac.uk/>)

AWARDS AND ACHIEVEMENTS

1. **Distinction in Doctoral Research Award** from Indian Institute of Technology - Delhi (April 2016).
2. **Best Oral Presentation Award**, "International Winter School in Frontiers of Materials Science - 2018", JNCASR, Bangalore, India (3-7 Dec 2018).

3. Selected as a Physicist from the UK for participation in fully funded Newton-Bhabha (Indo-UK) Workshop on "**Translating Clean Energy Research to Rural India**", IISER Pune, India (04-08 Sep, 2017).
4. **Best Poster Presentation Award**, 7th UK - Japan Symposium on Fundamental Research Advances in Carbon Nanomaterials, **Royal Society of Chemistry, London, UK** (13 June 2016).
5. **Best Student Oral Presentation Award** for Young Scientists Forum in ICOOPMA 2014, **University of Leeds, UK** (27 July-1 Aug 2014).
6. **Best Poster Presentation Award** from SPIE in International Conference on Fiber Optics and Photonics-2012, IIT Madras, Chennai, India.
7. **Best Poster Presentation Award** in 2nd International conference on Advanced Nanomaterials and Nanotechnology, ICANN 2011, IIT Guwahati, India.
8. University 2nd Rank in M. Tech (Nanotechnology).

INTERNATIONAL VISITS FOR RESEARCH WORK

1. Visiting Research Fellow at NanoManufacturing Group, Institute for Manufacturing, Department of Engineering, University of Cambridge, UK with **Dr. Michael De Volder** for duration of ~ **1.5 months** (27 May- 07 July 2019).
2. Visiting Scientist at NanoPhotonics Centre, Cavendish Lab, University of Cambridge, UK with **Prof. Jeremy J. Baumberg (FRS)** for a duration of **3 months** after Ph.D thesis submission (May 2014-Aug 2014).
3. Research Student Visitor at NanoPhotonics Centre, Cavendish Lab, University of Cambridge, UK with **Prof. Jeremy J. Baumberg (FRS)** for a duration of **3 months** during Ph.D (May 2011- July 2011).

RESEARCH GRANTS (After Joining JMI)

- 1- Funding Agency: **SERB**. Grant: **ECRA** (Early Career Research Award). Sanction Order No.: ECR/2018/002056. Date: 22.03.2019. **Amount: Rs 48,98,476/-**. **Principal Investigator: Dr. Shahab Ahmad**
- 2- Funding Agency: **DST**. Grant: **UK-IERI** Indo-UK Joint International Research Project. Sanction Order No.: DST/INT/UK/P-167/2017. Date: 03.10.2018. Amount: **Rs 27,65,140/- (India Side) and GBP: 20,086 (UK Side)**. **Principal Investigators: Dr. Shahab Ahmad (India) and Dr. Michael De Volder (UK)**.
- 3- Funding Agency: **UGC**. Grant: **Start-Up Research Grant**. Order No. F.30-422/2018 (BSR). Date: 29.06.2018. Amount: **Rs 10,00,000/-**. **Principal Investigator: Dr. Shahab Ahmad**.
- 4- Funding Agency: **DST**. Grant: Materials for Energy Storage (MES) – 2018. Approved (Estimated Cost: **Rs 95 Lacs INR**). **Principal Investigator: Dr. Shahab Ahmad**.

PATENTS

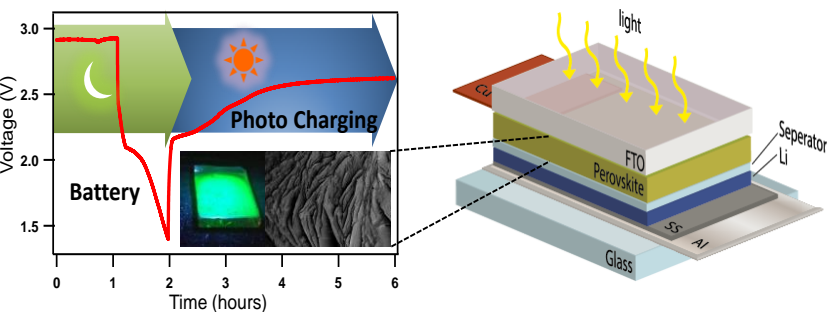
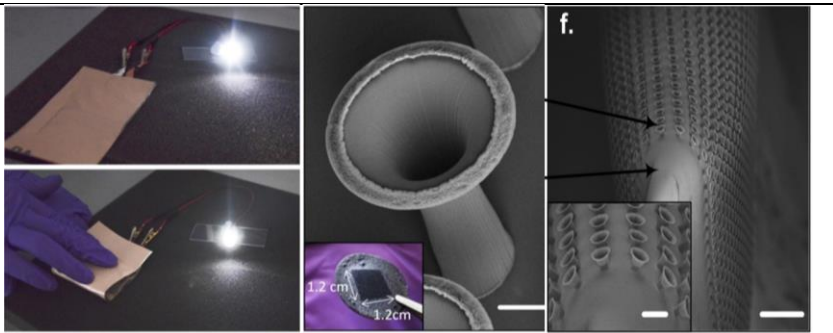
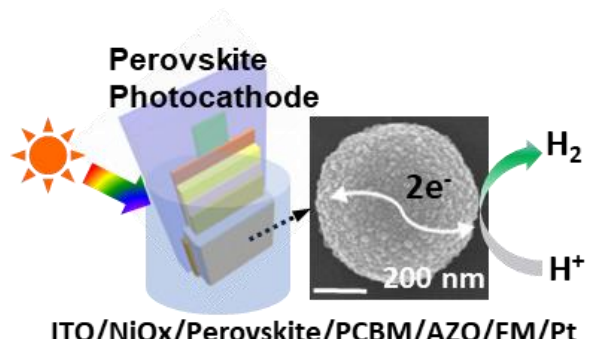
1. (WO2018215470) "RECHARGEABLE ELECTROCHEMICAL CELLS, METHODS FOR THEIR MANUFACTURE AND OPERATION", UK Patent (Application number: GB1708175.3). Inventors: **Shahab Ahmad**, C. George, Jeremy J Baumberg, Michael De Volder. Pub. No. WO/2018/215470, International Application No.: PCT/EP2018/063392, Publication Date: 29.11.2018. <https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2018215470&tab=PCTBIBLIO&maxRec=1000>

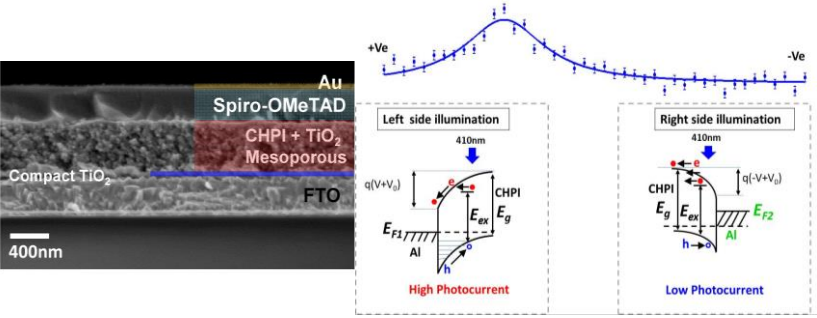
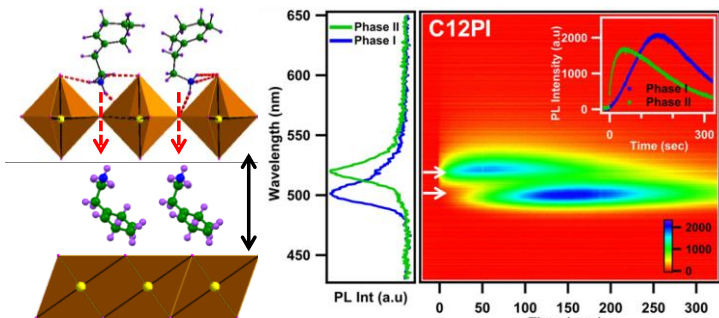
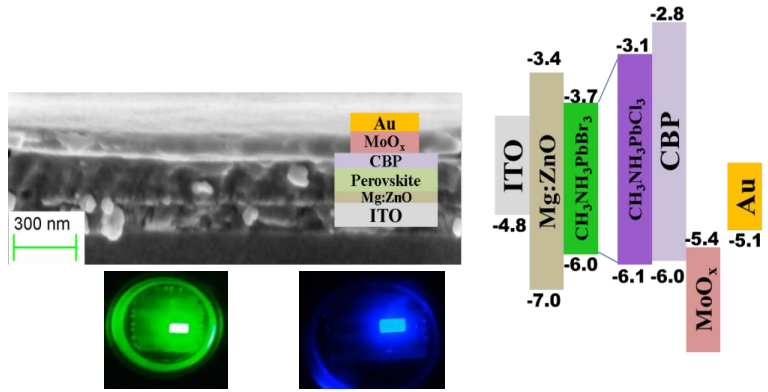
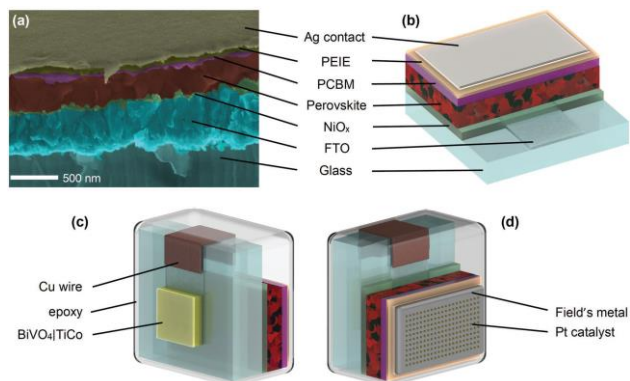
INTERNATIONAL JOURNAL PUBLICATIONS (Selected Publications only)

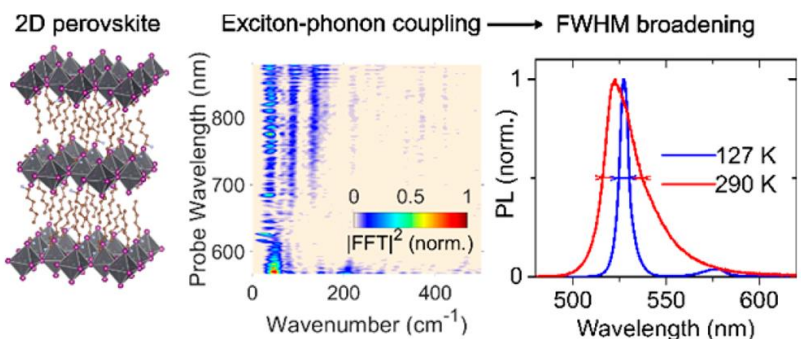
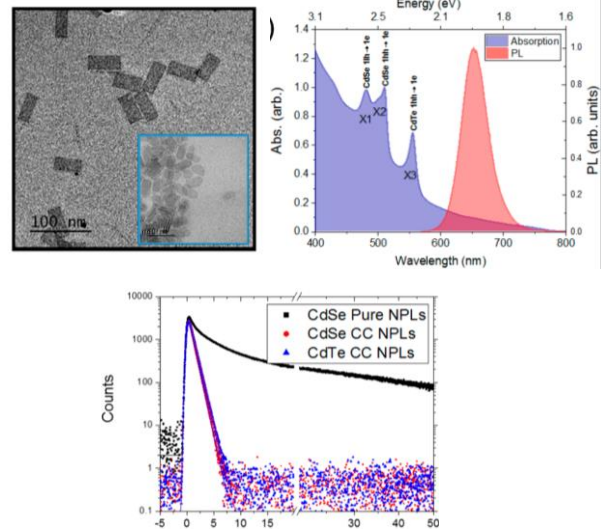
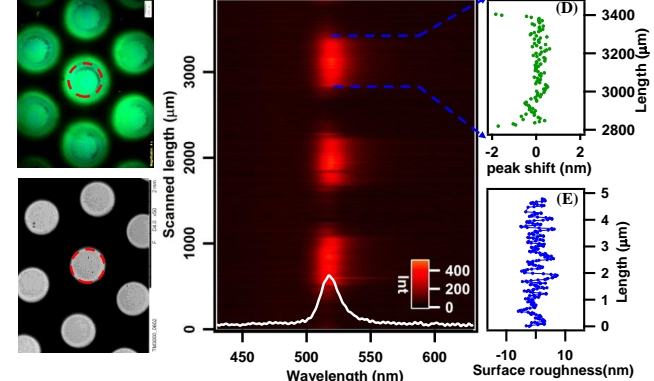
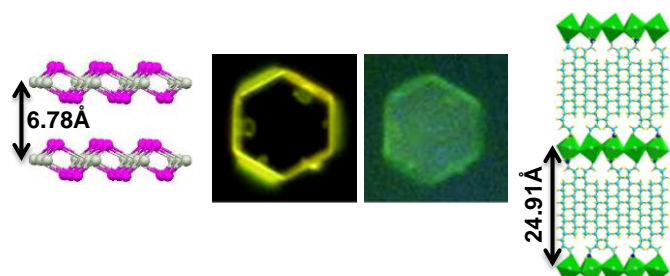
Total Publications: 35+

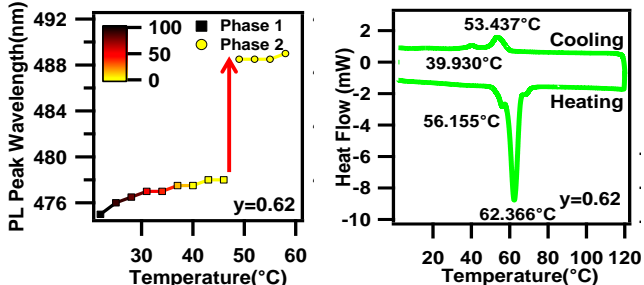
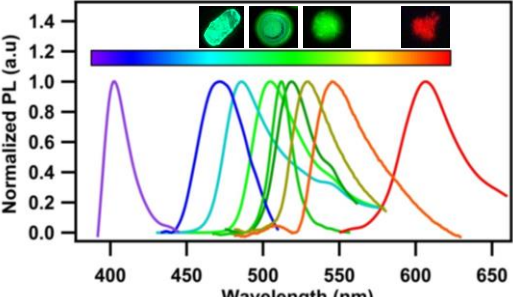
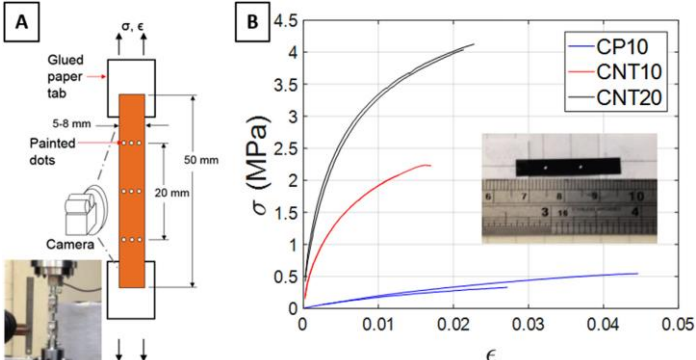
Total Impact Points: 160+; Citations: 630+.

Google Scholar: <https://scholar.google.co.uk/citations?user=c959JfwAAAAJ&hl=en>

<p>1. Shahab Ahmad, C. George, D. Beesley, Jeremy Baumberg and Michael De Volder, "Photo-Rechargeable Organo-Halide Perovskite Batteries", <i>Nano Letters</i> 18, (2018) 1856-1862. (Impact Factor: 12.279, link)</p>	
<p>2. Shahab Ahmad, Davor Copic, Chandramohan George and Michael De Volder, "Hierarchical Assemblies of Carbon Nanotubes for Ultraflexible Li-Ion Batteries", <i>Advanced Materials</i> 05 (2016). (Impact Factor: 25.809, link)</p>	
<p>3. Shahab Ahmad, Aditya Sadhanala, Robert LZ Hoyer, Virgil Andrei, Mohammad Hadi Modarres, Baodan Zhao, Jan Rongé, Richard H Friend, Michael De Volder, "Triple Cation based Perovskite Photocathodes with AZO Protective Layer for Hydrogen Production Applications", <i>ACS Applied Materials & Interfaces</i> 11 (2019) 23198-23206. (Impact Factor: 8.456, link)</p>	

<p>4. Shahab Ahmad, Pawan Kumar Kanaujia, Harry J Beeson, Antonio Abate, Felix Deschler, Dan Credgington, Ullrich Steiner, G Vijaya Prakash and Jeremy J Baumberg, “Strong photocurrent from 2D excitons in solution-processed stacked perovskite semiconductor sheets”, ACS Applied Materials & Interfaces 7 (2015) 25227. (Impact Factor: 8.456, link)</p>	
<p>5. Shahab Ahmad, Pawan K. Kanaujia, Wendy Niu, Jeremy J. Baumberg and G. Vijaya Prakash, “In-situ intercalation dynamics in inorganic-organic layered perovskite thin films”, ACS Applied Materials and Interfaces 6 (2014) 10238. (Impact Factor: 8.456, link: Selected as ACS Editors’ Choice Article)</p>	
<p>6. Aditya Sadhanala, Shahab Ahmad, Baodan Zhao, Siân E Dutton, Felix Deschler, Phoebe M. Pearce, Nadja Giesbrecht, Robert L. Z. Hoye, Karl C Goedel, Thomas Bein, Pablo Docampo, Michael F. L. De Volder and Richard H. Friend. “Blue-Green Colour Tunable Solution Processable Organolead Chloride-Bromide Mixed Halide Perovskites for Optoelectronic Applications”, Nano Letters 15 (2015) 6095. (Impact Factor: 12.279, link)</p>	
<p>7. Virgil Andrei, Robert LZ Hoye, Micaela Crespo-Quesada, Mark Bajada, Shahab Ahmad, Michael De Volder, Richard Friend, Erwin Reisner, “Scalable Triple Cation Mixed Halide Perovskite-BiVO4 Tandems for Bias-Free Water Splitting”, Advanced Energy Materials (2018) 1801403. (Impact Factor: 24.884, link)</p>	

<p>8. Limeng Ni, Uyen Huynh, Alexandre Cheminal, Tudor H. Thomas, Ravichandran Shivanna, Ture F. Hinrichsen, Shahab Ahmad, Aditya Sadhanala and Akshay Rao, "Real-Time Observation of Exciton-Phonon Coupling Dynamics in Self-Assembled Hybrid Perovskite Quantum Wells", <i>ACS Nano</i> 11 (2017) 10834-10843. (<i>Impact Factor: 13.709</i>, link)</p>	 <p>2D perovskite structure is shown on the left. The central heatmap illustrates exciton-phonon coupling, with the color scale representing the normalized squared magnitude of the inverse fast Fourier transform, $IFFT ^2$ (norm.), ranging from 0 to 1. The x-axis is Wavenumber (cm^{-1}) from 0 to 400, and the y-axis is Probe Wavelength (nm) from 600 to 800. The right plot shows the photoluminescence (PL) intensity (norm.) versus Wavelength (nm) from 500 to 600 nm, comparing the full width at half maximum (FWHM) at 127 K (blue line) and 290 K (red line), demonstrating FWHM broadening at higher temperature.</p>
<p>9. Raj Pandya, Richard YS Chen, Alexandre Cheminal, Marion Dufour, Johannes M Richter, Tudor H Thomas, Shahab Ahmad, Aditya Sadhanala, Edward P Booker, Giorgio Divitini, Felix Deschler, Neil C Greenham, Sandrine Ithurria and Akshay Rao. "Exciton-Phonon Interactions Govern Charge-Transfer-State Dynamics in CdSe/CdTe Two-Dimensional Colloidal Heterostructures", <i>Journal of the American Chemical Society</i> 140 (2018) 14097-14111. (<i>Impact Factor: 14.695</i> link)</p>	 <p>Figure 9 includes a transmission electron microscopy (TEM) image of CdSe/CdTe heterostructures with a 100 nm scale bar. The top right plot shows the absorption (Abs., blue shaded area) and photoluminescence (PL, red shaded area) spectra versus Wavelength (nm) from 400 to 800 nm. The energy levels (eV) are indicated at the top: 3.1, 2.5, 2.1, 1.8, and 1.6. The bottom plot shows the PL decay dynamics, plotting Counts versus Time (ns) from -5 to 50 ns. The legend identifies the data for CdSe Pure NPLs (black squares), CdSe CC NPLs (red circles), and CdTe CC NPLs (blue triangles).</p>
<p>10. Shahab Ahmad, Chintam Hanmandlu, Pawan K. Kanaujia and G. Vijaya Prakash, "Direct deposition of highly ordered inorganic organic perovskite thin films: optimization and optoelectronic applications", <i>Optical Materials Express</i> 4 (2014) 1313. (<i>Impact Factor: 2.66</i>, link: One of the top Downloads of the Journal - July 2014).</p>	 <p>Figure 10 displays the morphology and optoelectronic properties of perovskite thin films. On the left, SEM and TEM images show the film surface and grain structure. The central plot is a photoluminescence (PL) map showing intensity versus Scanned length (μm) from 0 to 3000 μm and Wavelength (nm) from 450 to 600 nm. The color scale for PL intensity ranges from 0 to 400. On the right, two plots show the relationship between PL intensity and surface roughness: (D) Length (μm) versus peak shift (nm) from -2 to 2, and (E) Length (μm) versus Surface roughness (nm) from -10 to 10.</p>
<p>11. I. Saikumar, Shahab Ahmad, J. J. Baumberg and G. Vijaya Prakash, "Fabrication of excitonic luminescent Inorganic-Organic hybrid Nano and Microcrystals", <i>Scripta Materialia</i> 67 (2012) 834. (<i>Impact Factor: 3.747</i>, link)</p>	 <p>Figure 11 illustrates the crystal structure and morphology of inorganic-organic hybrid nano/microcrystals. On the left, a schematic shows the crystal lattice with a lattice parameter of 6.78 Å. The middle shows SEM and TEM images of the crystals. On the right, a 3D model of the crystal structure is shown with a lattice parameter of 24.91 Å.</p>

<p>12. Shahab Ahmad, Jeremy J. Baumberg, and G. Vijaya Prakash, "Structural tunability and switchable exciton emission in inorganic-organic hybrids with mixed halides", Journal of Applied Physics 114 (2013) 233511. (<i>Impact Factor: 2.328</i>, link)</p>	 <p>The left plot shows PL Peak Wavelength (nm) vs Temperature (°C) for Phase 1 (black squares) and Phase 2 (yellow circles). Phase 1 shows a linear increase with a slope of y=0.62. Phase 2 shows a sharp increase starting around 45°C. The right plot shows Heat Flow (mW) vs Temperature (°C) for cooling and heating cycles. Key transition temperatures are marked: 53.437°C (cooling), 39.930°C (heating), and 62.366°C (heating). A slope of y=0.62 is also indicated.</p>
<p>13. Shahab Ahmad and G. Vijaya Prakash, "Strong room-temperature UV to red excitons from inorganic organic layered perovskites, (R-NH₃)₂MX₄ (M=Pb²⁺, Sn²⁺, Hg²⁺; X=I, Br)", Journal of Nanophotonics 8 (2014) 083892. (<i>Impact Factor: 1.429</i>, link)</p>	 <p>The plot shows Normalized PL (a.u.) vs Wavelength (nm) for various compositions. The spectra show a shift from UV (~400 nm) to red (~650 nm) as the composition changes. An inset shows the corresponding photoluminescence images for each peak, with a color scale from blue to red.</p>
<p>14. Sarah Jessl, David Beesley, Simon Engelke, Christopher J. Valentine, Joe C. Stallar, Norman Fleck, Shahab Ahmad, Matthew T. Cole and Michael De Volder, "Carbon nanotube conductive additives for improved electrical and mechanical properties of flexible battery electrodes", Materials Science & Engineering A (2018) 735, 269-274. (<i>Impact Factor: 3.507</i>, link)</p>	 <p>Part A shows a schematic of a flexible electrode with a glued paper tab, 5-8 mm width, and 20 mm length. It is tested under stress (σ) and strain (ε). Part B shows a stress-strain (σ vs ε) plot for CP10 (blue), CNT10 (red), and CNT20 (black) samples. The CNT20 sample shows the highest strength and strain. An inset shows a photograph of the electrode being tested.</p>

CONFERENCES, WORKSHOPS, SYMPOSIUMS AND SUMMER SCHOOL

1. International **Winter School** in Frontiers of Materials Science -2018, JNCASR, Bangalore, India (03-07 Dec 2018, Poster and Oral Presentation).
2. Newton-Bhabha (**Indo-UK**) **Workshop** on "Translating Clean Energy Research to Rural India", IISER Pune, India. (04-08 Sep, 2017, Discussion and Oral Presentation)
3. **Materials Research Society (MRS)**, Spring Meeting, Phoenix, Arizona, USA. (16-21 April, 2017, Poster presentation)
4. 7th UK - Japan Symposium on Fundamental Research Advances in Carbon Nanomaterials, Royal Society of Chemistry (**RSC**), London, UK. (13 June 2016, Poster presentation)
5. **Winton Symposium** on "Solar Energies", Cavendish Laboratory, University of Cambridge, UK. (03 Nov 2016)
6. **Winton Symposium** on "Green Computing", Cavendish Laboratory, University of Cambridge, UK. (28 Sep 2015)
7. **ICOOPMA-2014** (Sixth International Conference on Optical, Optoelectronic and Photonic

- Materials and Applications), University of Leeds, UK. (27 July-1 Aug, 2014, Oral presentation)
8. **IUMRS-ICA 2013**, Indian Institute of Science, Bangalore, India. (16-20 Dec, 2013, Poster presentation)
 9. **Focused discussion meeting on Metamaterials and Photonic Nanostructures**, Indian Institute of Technology, Kanpur, India. (16- 17 Aug, 2013, Poster presentation)
 10. **Third International Conference on Multifunctional, Hybrid and Nanomaterials**, Sorrento, Italy. (3-7 March-2013, Oral presentation)
 11. **The International Conference on Fiber Optics and Photonics-2012**, IIT Madras, Chennai, India. (9-12 Dec-2012, Poster presentation)
 12. **CFN-KIT Summer School on Nanophotonics 2012**, Bad Herrenalb, Karlsruhe, Germany. (10-13 Sep-2012, Poster presentation)
 13. **16th International workshop on Physics of Semiconductor Devices, IWPSD 2011**, IIT Kanpur, India. (19-22 Dec-2011, Poster presentation)
 14. **2nd International conference on Advanced Nanomaterials and Nanotechnology, ICANN 2011**, IIT Guwahati, Guwahati, India. (8-10 Dec-2011, Poster presentation)
 15. **36th OSI Symposium on Frontiers in Optics and Photonics (FOP11) 2011**, IIT Delhi, India. (3-5 Dec-2011)
 16. Organized and participated in workshop on **Recent Trends in Nanophotonics 2011**, IIT Delhi, India. (30 Sep-1 Oct-2011, Poster presentation)
 17. **Nanotechnology Business: The giant in Dwarfs 2009**, Organized by Confederation of Indian Industry (CII) at Hotel Taj, New Delhi, India.

ORGANISER

- 1- **Secretary**, International Conference on Advanced Materials- ICAM-2019, Organised by Centre for Nanoscience and Nanotechnology at Jamia Millia Islamia (Central University), New Delhi. (March 06-07, 2019) (Participants- 650+).
- 2- **Convener**, One day UKIERI-Workshop on “*Photo-Rechargeable Perovskite Batteries for future mobility*” Organized at Centre for Nanoscience and Nanotechnology, Jamia Millia Islamia (Central University), New Delhi. (March 08, 2019). (Participants- 50+).

CONSULTANCY PROJECTS

1. Successfully completed consultancy project with Nano-Lit Technologies (NLT) Limited, Edinburgh, on the Application of Quantum Dots for Lightening Products. [Amount: 4200 GBP]

PRESENT RESEARCH INTREST

1. Energy Storage devices, Photo-Battery for Energy storage
2. Flexible and Stretchable Electrodes for next generation Energy devices
3. Solar Water Splitting-H₂ production
4. Optoelectronics of Metal Halide Organo-Perovskites for Photo-detectors, LED applications