

**Report**  
**on**  
**One-week Hands-on Training Workshop on**

*“Synthesis and Characterization of Nanomaterials for Energy, Lighting & Bio-imaging Applications”*

7<sup>th</sup> Nov. - 13<sup>th</sup> Nov., 2022

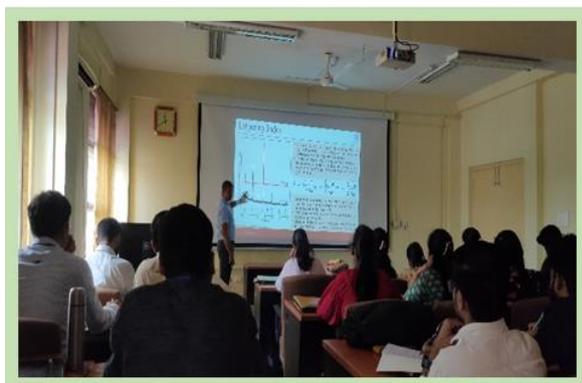
VENUE: Department of Physics, IIT(ISM), Dhanbad

In collaboration with

Aligarh Muslim University (AMU), Aligarh

**Day-1: Report**

<b>Time</b>	<b>Activity</b>
9.00 AM – 9.30 AM	Inauguration function was held successfully
10.15 AM – 11.45 AM	Lecture-1: Talk on XRD basics was given by Dr. P. M. Sarun. He explained the basics of XRD diffraction pattern analysis and also discussed how one can estimate the strain, crystallite size, and percentage of mixed phase using XRD diffraction pattern.
10.45 AM – 1.20 PM	Lecture-2: Talk on semiconductor quantum materials and introduction to Rietveld analysis was given by Dr. R. Thangavel. He elaborated the need of quantum dots and summarised its applications. In addition to this he also explained the structural study with the help Rietveld refinement of X-ray diffraction data.
2.30 PM – 5.40 PM	Hands-on on Rietveld analysis was given by Dr. R. Thangavel and Quantum dot synthesis lab was done.



### Day-2: Report

Time	Activity
9.30 AM – 10.45 AM	<p>Lecture-3: Talk on the development of optical materials from past to recent advances by Dr. S. K. Sharma.</p> <p>He discussed the preparation of lanthanide and transition metal doped photo luminescent materials and he also enlighten the concept of optical stimulated luminescent materials.</p>
11.00 AM – 12.15 PM	<p>Lecture-4: Talk on phenomenon of photon upconversion in lanthanide: basics, mechanism and its application was given by Dr. S. K. Singh.</p> <p>He explained the mechanism and applications of up-converting materials in optical thermometry using temperature dependent upconversion emission spectra and in security printing.</p>
02.30 PM – 04.30 PM	<p>Hands-on training session for the measurement of thermo-luminescence and upconversion emission spectrum was given by Dr. S. K. Sharma and Dr. S. K. Singh, respectively.</p>

05.00 PM – 06.10 PM	<p>Special Thematic lecture on development of phosphor for phosphor coated LED device was given by Dr. Sudipta. Som through online mode.</p> <p>He explained the recent advances in phosphor and other luminescent materials for its applications in the field of lightning and display devices.</p>
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### Day-3: Report

Time	Activity
9.30 AM – 10.45 AM	<p>Lecture-5: Talk on the nanosheet coatings for electronic and solar panels by Dr. Aditya Kumar.</p> <p>He explained the different aspects and applications of coating of nanoparticles over different substrates for different applications in the branch of solar panels, electronic devices and research lab dresses.</p>
11.00 AM – 12.15 PM	<p>Lecture-6: Talk on synthesis strategy of upconversion nanoparticles for biological applications by Dr. S. K. Sahu</p>

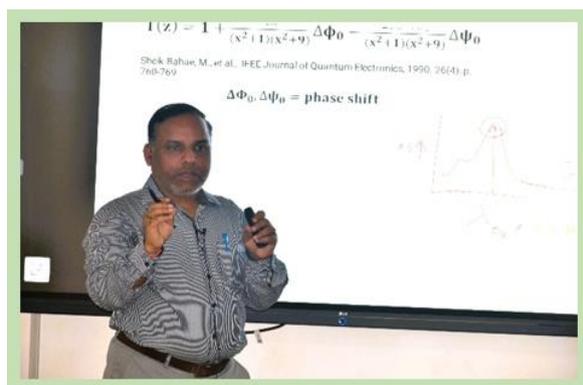
	He enlightened the synthesis of up-converting nanoparticles using different synthesis routes for biomedical applications.
02.30 PM – 04.30 PM	Hands-on training session for the synthesis of up-converting nanoparticles and measurement of FTIR spectrum and XRD diffraction patterns of the samples. Two hands-on sessions were given.
05.00 PM – 06.10 PM	Special Thematic lecture on tailoring photon up-converted light for sensing and biological applications was delivered by Dr. M. K. Mahata.  He explained how the pH value of solvent effects the upconversion emission of colloidal upconverting nanoparticles. Further he explained the utilisation of this effect for applications in biomedical fields.



#### Day-4: Report

Time	Activity
9.30 AM – 10.45 AM	Lecture-7: Talk on applications of Z-scan technique in soft condensed matter physics was given by Dr. U. Tripathy.

	He first explained the fundamental of nonlinear optics and then he explained the basics of Z-scan technique for the estimation of non-linearity of bio-samples.
11.00 AM – 12.15 PM	Lecture-8: Talk on characterizing valued aided nanometric materials at green energy and other applications was given by Dr. S. Ram. He elaborated the basic fundamental concept of defining nanomaterial, atoms, and molecules and then discussed its formation under different conditions for the application in several fields.
02.30 PM – 04.30 PM	Hands-on training sessions for Z-scan technique and UV-VIS spectroscopy were given.
05.00 PM – 06.10 PM	Participants were visited to Centre for innovation, incubation and entrepreneurship building IIT(ISM) which is equipped with the different facilities for the research and innovations.



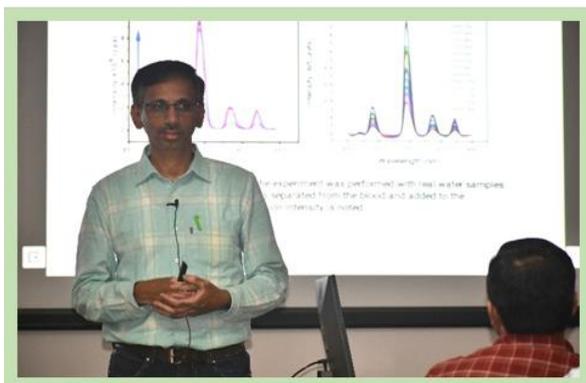
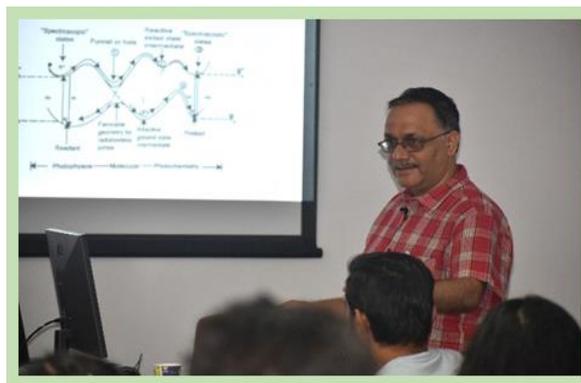
## Day-5: Report

Time	Activity
9.30 AM – 10.45 AM	<p>Lecture-9: Talk on bio functionalization of nanomaterial was given by Prof. Dulal Senapati.</p> <p>First, he discussed the history of nanoparticles and then he explained how these nanoparticles (mainly gold and silver nanoparticles) of different shape and sizes can be prepared for different applications.</p>
11.00 AM – 12.15 PM	<p>Lecture-10: Talk on synthesis of nanomaterials for the production and storage of hydrogen energy by Dr. T. P. Yadav</p> <p>First, he explained the requirement for hydrogen energy to reduce the effect of global warming and then further he explained problem faced by the researchers for storage of hydrogen energy. Lastly, he explained the preparation of materials for hydrogen energy generation.</p>
02.30 PM – 05.00 PM	Hands-on training sessions were given for the FE-SEM, Fluorescence Microscopy, Cell culture and DLS.
05.10 PM – 06.10 PM	Interaction session with the participants was done to know about their work area, problems faced and future plan of research.



### Day-6: Report

<b>Time</b>	<b>Activity</b>
9.30 AM – 10.45 AM	<p>Lecture-11: Talk on the structural and morphological study of the sample through FE-SEM and TEM image analysis was delivered by Dr. Jai Singh.</p> <p>He explained the morphological study of prepared materials using SEM and TEM images. Along with this he also discussed the instrumentation of SEM and TEM.</p>
11.00 AM – 12.15 PM	<p>Lecture-12: Talk on steady state and time resolved spectroscopy was given by Prof. H. Mishra.</p> <p>First, he explained the basics of photoluminescence phenomenon of steady state and time resolved spectroscopy. Further he explained the instrumentations of the steady state and time resolved spectrophotometers.</p>
02.00 PM – 03.00 PM	<p>Lecture-13: Talk on lanthanide doped luminescent colloidal nanocrystals and their applications was given by Prof. V. Mahalingam.</p> <p>Firstly, he talked about the advantage of using lanthanides as luminescent materials then he explained the synthesis of colloidal lanthanide doped nanoparticles for the detection of heavy metal ions in water.</p>
03.15 PM – 05.30 PM	<p>Hands on training session for the measurement of steady state and time resolved photoluminescence spectrum of the sample was given by Prof. H Mishra.</p>



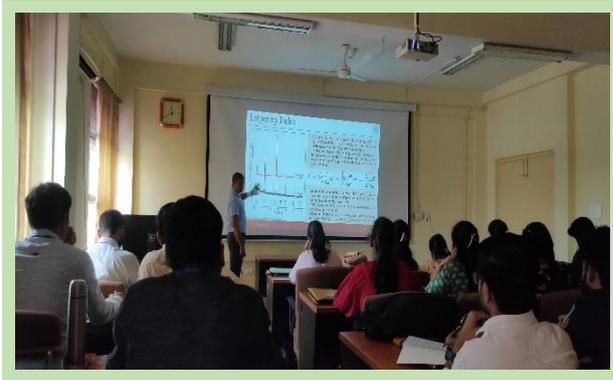
### Day-7: Report

Time	Activity
9.30 AM – 10.45 AM	Lecture-14 was given by Dr. Somnath Roy, IIT-ISM, Dhanbad on Raman Spectroscopy and its applications. He has explained what information one can extract from Raman spectra.
11.00 AM – 01.00 PM	Hands-on was given on Micro-Raman Spectrometer. All features of the Raman like Raman spectra, Raman imaging, photoluminescence spectra, photoluminescence imaging and upconversion emission imaging were demonstrated. Participants have witnessed all the activities carefully.
3.30 PM – 04.20 PM	Valedictory function was held. Dean (R&D) was invited as chief guest. Few participants have shared their experience about the training programme.

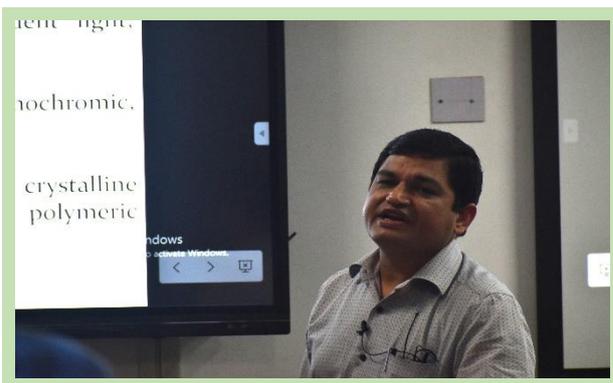


***More Photographs***  
**STUTI - 2022**  
**IIT(ISM), Dhanbad**

**Day-1 (07/11/2022)**



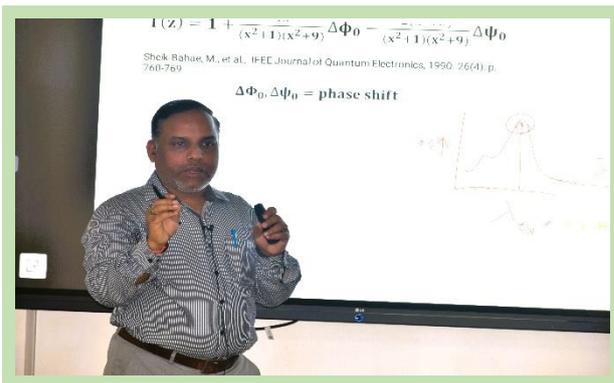
**Day-2 (08/11/2022)**



## Day-3 (09/11/2022)



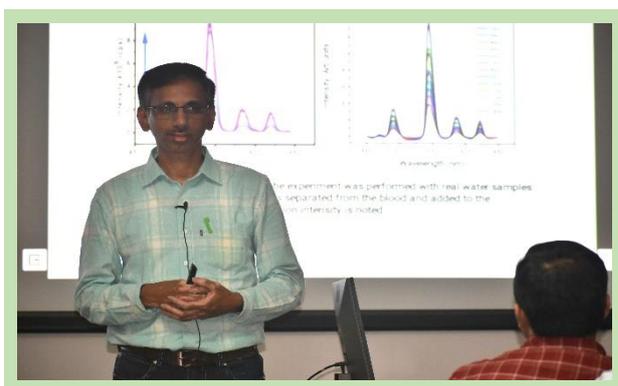
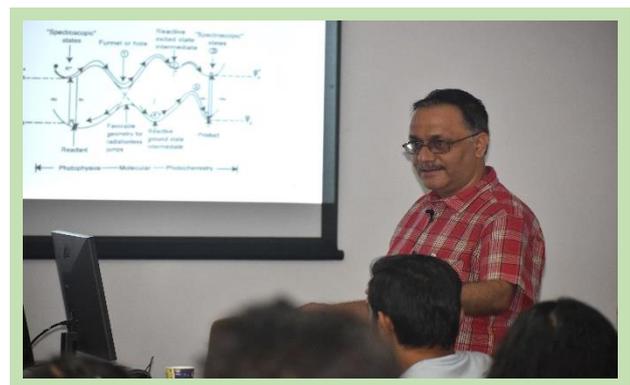
## Day-4 (10/11/2022)



## Day-5 (11/11/2022)



## Day-6 (12/11/2022)



## Day-7 (13/11/2022)

