

Dr. Debdas Ray, Assistant Professor, Department of Chemistry receives an Individual Centric **four-year Research grant of 50 Lakhs** (including one instrument; fluorescence spectrometer) from Science and Engineering Research Board (SERB), India Govt. under the special scheme "Empowerment and Equity Opportunities in Excellence in Science". The project title is "*dihedral angle controlled functionalized luminescent materials for optoelectronic applications*".



Recently, Dr. Ray has also been awarded an Individual Centric **three-year research grant of 25 Lakhs** by SERB under the Start Up Research Grant (Young Scientists) scheme. The project title is "*Solid-state luminescence active ultra-rigid neutral coordination complex of zinc(II) and aluminium(III)*".

### Objective of the projects

We have been developing low cost and high efficient solid state light emitter, particularly in the context of the search for neutral coordination complex materials for **advanced energy applications**, such as OLED, sensors and among others. In this perspective, tetrahedral coordination complexes (two chelate ligand, where each ligand contains two donor atoms) and octahedral coordination geometry (three chelate ligands, where each ligand contains two donor atoms around a metal center) suffers from severe disadvantages such as ligand coordination environment, *i.e.*, incorporation of a weakly bound chelate ligand appears to create a flexible environment around the metal center that encourage (i) ligand dissociation from the excited state, (ii) distortion of the resulting complex, and (iii) activation of non-radiative channels ( $\pi$ - $\pi$  interactions). Therefore, controlling their high efficient emitting property remains a challenge. We have been trying to address these challenges to meet real technological applications. We are currently conducting structure-property analyses to find the mechanism by which these complexes emit photoluminescence in the solid-state, and ways to control their photophysical properties.

We are also developing the neutral coordination complex-based emitter whose emission profile can be controlled by temperature (**thermally activated delayed fluorescence-TADF**). We are currently looking into blue and red-NIR emitters, so we can use these materials in various optoelectronic and bio-applications.

The group is also developing modular organic-based solid-state light emitters. These ultra-rigid systems emits blue, yellow and red light, have large Stokes shifts, broad emission bandwidths. The main focus with this family will be the control of these photophysical properties along with intermolecular interactions ( $\pi$ - $\pi$ ), so the molecules can be **used as blue/red and white emitters in advanced energy applications**, such as light-emitting electrochemical cells and White OLEDs.

For more information please visit:

[http://www.snu.edu.in/naturalsciences/debdas\\_ray\\_profile.aspx](http://www.snu.edu.in/naturalsciences/debdas_ray_profile.aspx)