National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Yttrium Tungstate-based Upconverting Host Crystals for Temperature Sensing Application
Speaker	: Swarnaprava Mohanty (Rollno : 522cy3009)
Supervisor	: Prof. Supratim Giri
Venue	: Department of Chemistry, Seminar hall (MC 219)
Date and Time	: 26 Jun 2024 (11.00 am)
Abstract	: Photon upconversion through the use of lanthanide-doped materials has been the focus of a major part of research in the fields of materials chemistry and physics for more than 50 years. The attraction of this field is the ability to generate photons at shorter wavelengths than the excitation wavelength after laser stimulation. Besides their extensive use in the field of bioimaging, drug delivery and sensors, temperature sensing based on the fluorescence intensity ratio (FIR) of upconversion materials that suffers with low sensitivity still needs host crystal with strong upconversion luminescence (UCL) intensity. Here a series of Y_2WO_6:Er^{3+}/Yb^{3+} nano crystals were synthesized via high temperature solid state method. The luminescence intensity was tuned by varying different mol% of Er^{3+} and Yb^{3+}. For further enhancing the UCL intensity, the crystal engineering route has been adopted by introducing a non-lanthanide ion (Li^{+}) in different mol % inside the host lattice. The respective UCL intensities as well as the absolute sensitivity of the crystals got enhanced first and then diminished after a certain Li^{+} concentration. An in-depth structural analysis has been done by using the synchrotron X-ray diffraction (SXRD) experiments to trace the structural changes inside the crystal lattice after incorporation of Li^{+} that is responsible for the above enhancement. As there are no major changes has been noticed in terms of structural and morphological analysis we headed for an atomic level study by calculating the lattice strain from the SXRD data using Williamson-Hall method. Interestingly, at highest value of strain, the local disorder is maximum with maximum UCL intensity and absolute sensitivity. The proposed research work is aimed to find the fundamental connection between the local disorder with the compressive lattice strain, UCL intensity and the absolute sensitivity.