Registration Seminar

Seminar Title	: Surface Passivation of Perovskite Single Crystal materials for optoelectronic devices
Speaker	: Priyanka Gupta (Rollno : 522ch1003)
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Venue	: New Seminar Room, Department of Chemical Engineering
Date and Time	: 18 Mar 2024 (11:00 AM)
Abstract	: Perovskite materials grabbed the interest of the scientific committee due to their remarkable optical (high optical absorption coefficient), electrical (high charge mobility and long carrier diffusion length), and tunable bandgap features. It is used to make uncooled, low-cost, lightweight, and flexible photodetectors, LEDs, lasers, solar cells, and a variety of other devices. The optoelectronic property of a material changes dramatically when its dimension is reduced from 3D (bulk) to 2D, 1D, and 0D. Although the bulk 3D perovskite materials' power conversion efficiency has greatly improved, they are unstable in the presence of moisture, heat, and ion migration, which has hampered commercial production. Materials such as MAPbBr3 (Methylammonium lead bromide), MAPbI3 (Methylammonium lead iodide), and MAPbCl3 (Methylammonium lead chloride) are included to improve its stability. The optimized inverse temperature crystallization process was employed to generate single crystals of perovskite materials. By changing the solution concentration and diluting the anti-solvent, the crystal formation process was optimized. The crystal growth rate was calculated using a vernier caliper was ~6mm and ~9mm in size. It was also calculated using ImageJ and found to be 2.15mm and 3.4 mm. The morphology of MAPbBr3 and MAPbI3 obtained from FESEM, SEM, and an optical microscope showed cubic (orange) and tetragonal (black) structures with defects. Through the XRD plot, the presence of the (100) plane and (110) plane is currently being identified, confirming the formation of the material. The EDS of the MAPbBr3 sample confirmed the presence of Pb and Br in an atomic ratio of 1.3. The phenomenon of inverse or retrograde solubility, as well as its corresponding inverse temperature crystallization technique, represents a significant step forward in the realm of perovskite material research for applications such as IR detectors, solar cells, photodetectors, and photocatalysis.