Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Internal Seminar

Tuneable Architectures and Functionalities in Rare-Earth and Copper-Based MOFs: From Structure to Application

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Metal-organic frameworks (MOFs) are crystalline porous materials formed through the coordination of metal ions or clusters with multidentate organic ligands. Their high surface area, structural tunability, and functional diversity have positioned them as promising candidates for a range of targeted applications, including gas adsorption, separation, catalysis, sensing, and photoluminescence. In this seminar, I will discuss two structurally and functionally distinct families of MOFs developed using the ligand 2,5-bis(prop-2-yn-1-yloxy)terephthalic acid (2,5-BPTA). The first series, constructed with rare-earth metal ions, forms two- and three-dimensional frameworks and demonstrates efficient white-light emission through strategic Eu^{3+}/Tb^{3+} co-doping. The second family, based on copper, exhibits polymorphism and time/solvent-dependent single-crystal-to-single-crystal transformations. These transformations unveil dynamic structural evolution and enable heterogeneous catalytic activity for CO_2 fixation. Together, these case studies highlight the critical role of rational MOF design in tailoring framework dimensionality, photoluminescence behaviour, and post-synthetic responsiveness. The findings provide valuable insights into the structure-function interplay in MOFs and emphasize their potential in diverse application domains such as luminescent materials and heterogeneous catalysis.

Monday, Jul 14th 2025

14:30 Hrs

Seminar Hall, TIFRH