

Title and Abstract of the Talk by Dr. Rajib Kumar Singha

Title:

Metal nanoparticles supported metal oxides synthesis and their catalytic application for small molecule activation reactions

Abstract:

Activation small molecules like CH₄, CO₂, CO, NO, N₂O and other smaller hydrocarbons are significantly important for petrochemical industries but activating these molecules and transforming these into more important chemicals are quite challenging. Nanomaterials plays the significant part to overcome these challenges. Properties of nanomaterials like high dispersion, smaller active sites with specific surface planes and corner, edge sites, size and shape of active nanoparticles (NPs) plays significant role for chemical transformation with very low activation energies to selective products. In addition, smaller organic molecules like different nitroarenes, benzene, cyclohexane and number of other aromatic compounds hold significant importance in different chemical industries.

Now the nanomaterials for catalysing these activation/conversion reactions can be synthesized by different methods which results in different kinds of physico-chemical properties of those materials. Some of the methods that are used for this purpose are Impregnation, Co-precipitation, Hydrothermal, Controlled deposition, Chemical vapor deposition etc. The Talk is about the synthesis methods to synthesize materials with desired property and their characterization and application in small molecule activation reactions that I have worked on during PhD and Postdoctoral studies, which holds significant fundamental (for students) and industrial importance.

Some of the reaction topics are –

Partial oxidation of methane, Dry reforming of methane, Tri-reforming of methane, Oxidative coupling of methane, CO₂ hydrogenation, Alkyne semi-hydrogenation, Nitroarene reduction etc.