Au-Nanoparticle doped Nickel-Copper Bimetallic Pillared MOF: An Excellent Catalyst for Chemical Degradation of Rhodamine B.

Shazia Nabi and Dr. Mohsin Ahmad Bhat*

**Department of Chemistry, University of Kashmir, Srinagar, 190006, J&K, India.*
E-mail: mohsin@kashmiruniversity.ac.in

Abstract—*Among the various known porous materialsviz., zeolites, inorganic silicates, Metal Organic Frameworks, owing to their ultrahigh surface area, well defined porosity and tunable functionality have emerged as materials of great interest. With the in-built catalytic centres in the form of metal nodes, these offer great potential in the field of heterogeneous catalysis. In the recent years, MOFs have served as unique stabilizing matrices which allow implementation of desired properties by integration with different functional entities such as noble metal nanoparticles. Metal nanoparticle assisted catalysis is considered to be fast and highly efficient, owing to their huge surface to volume ratio and unique electronic properties but pertinent to their huge thermodynamic surface energy, their instability is of great concern. In this regard, various approaches for the stabilization of metal nanoparticles have been ruled out. One such approach includes the use of surface capping agents which in-turn render non availability of the catalytically active surface of the metal nanoparticle and also the incorporation of surface capping agents isa possible drawback. With the aim of stabilizing metal nanoparticlesand exploiting the possible synergism between the MOF and metal nanoparticle, we for the work to be presented successfully synthesized a bimetallic MOF using non- noble metals Ni and Cu as metal nodes and carboxylate based organic linkers. The bimetallic MOF consists of 2D layers formed by connection of 1,4-benzene dicarboxylic acid with the metal nodes which are further interconnected by a tripodal ligand 1,3,5-benzene tricarboxylic acid giving rise to a highly stable and robust 3D framework for encapsulation of gold (Au) nanoparticles within the pores. We investigated the catalytic activity of the as- synthesized catalyst using chemical degradation of an environmentally hazardous organic pollutant Rhodamine Bas a model reaction. An exceptionally high catalytic activity of the AuMNP doped MOF composite (*$k_{app} = 5.07\times10^{-2}\ min^{-1}$*) has been observed which is comparable to many of the so claimed state-of-art metallic nanophage catalysts designed for the reductive degradation of Rhodamine B.*