Abstract:

In this research project, hydrothermal synthesis of Copper-bipyridine MOF was executed using isonicotinic acid and 4,4'-bipyridine as ligand and co-ligand respectively. The structure and porous nature of MOF was confirmed by single crystal XRD analysis. Later, RhB@MOF and CR@MOF composites were synthesized by *ex-situ* method by soaking the MOF in Rhodamine B and Congo red dye solutions. The characterization and analysis of dye@MOF composites were done by FTIR, UV-Visible and Photo-luminescence spectroscopy. FTIR spectra revealed some additional functional group peaks along with the substantial shift of some peaks supporting the successful encapsulation of dye in the MOF. UV-Vis spectra of pristine MOF, RhB@MOF and CR@MOF composites were also recorded and compared. A promising red shift was observed in UV-Vis spectra of Dye@MOF composites in comparison to pristine MOF. The photo-luminescence analysis revealed the successful tuning of luminescence properties of Dye@MOF composites in comparison to the parent pristine MOF. The credit for enhanced luminescence could be attributed to the successful encapsulation of luminescent dyes in MOF skeleton. These luminescent composites were further harnessed to explore their potential for chemosensing. The chemosensing applications were explored against some potential explosives and pollutant materials. These RhB@MOF and CR@MOF composites exhibited chemosensing potential against Picric Acid and 2-Nitroaniline with K_{sv} value of $\mathbf{0.37\times 10^{-3}\ M^{-1}}$ and $\mathbf{0.54 \times 10^{-3}\ M^{-1}}$ respectively. These luminescent composites have the potential to be explored further against dye sensitized solar cells and a variety of electronic and optoelectronic devices.