

ABSTRACT

In this research project, six coordination complexes of Nickel metal with 1,2,4,5-Benzenetetracarboxylic acid ligand were synthesized by using different synthetic strategies ranging from sonication, reflux and solvothermal methodologies. Effect of co-ligand, choice of solvent, pH and molar ratios of the metal and ligand was also studied to optimize the synthetic conditions of the complexes. The synthesized coordination products were characterized by UV-Visible spectroscopy, FT-IR spectroscopy and Photo-Luminescence spectroscopy. Melting points and solubility of complexes in polar to nonpolar solvents were checked. The UV-Visible spectroscopic study was used to identify the possible electronic transitions of these complexes. The UV-Visible spectra obtained for the complexes and ligands were found to be different and exhibited red shift in λ_{max} values. FTIR spectra revealed the significant position shifts of peaks between free ligand or synthesized metal complexes and identification of functional groups. The photoluminescence analysis revealed the significant fluorescence of all the complexes and emission intensity in different solvents. This fluorescent nature of compounds was further utilized to check whether complex is PH sensor or not. The synthesized complexes have excellent photoluminescence properties and exhibit rapid response towards PH sensing. The luminescence sensing property investigations reveal that YM-26 exhibit turnon luminescence towards the H^+ concentration under basic condition, and could be served as potential pH sensors. The fluorescence spectra of complex 2 in different pH solutions (ranging from 3.55 to 9.03) results in increase in emission intensity. But there is no straightforward linear relationship between pH and intensity. The fluorescence spectra of complex 3 in different pH solutions (ranging from 3.4 to 10.26) were also measured. It showed decrease in emission intensity.

Key Words: MOFs, Solvent effect, Sonochemical, photoluminescence, fluorescent PH sensor