

ABSTRACT

The present work describes the coordination behavior of 5-Carboxyisophthalic acid (Trimesic acid) as a ligand while Dimethylformamide (DMF), Sodium azide and Tetrahydrofuran (THF) as co-ligands with Cobalt and Erbium metals under reflux and hydrothermal methods. $[\text{Co}(\text{Tri A})_2(\text{H}_2\text{O})_2] \cdot (\text{H}_2\text{O})$ (**1**) was synthesized by reflux method. Cobalt is six coordinated by four oxygen atoms [O(8), O(14), O(23) and O(29)] from two Tri A rings in a conventional *O,O'*-bidentate fashion and two oxygen atoms from two water molecules to generate CoO_6 octahedral geometry. While in $[\text{Co}(\text{Tri A})_2(\text{H}_2\text{O})_2] \cdot (\text{H}_2\text{O})_4$ (**2**) Cobalt is six coordinated by four oxygen atoms [O(11), O(12), O(26) and O(27)] from two Tri A rings, in a bidentate fashion while other carboxylate uses full coordination mode and two oxygen atoms from two water molecules. In complexes **1** and **2** cobalt (CoO_6) has octahedral geometry. $[\text{Co}(\text{Tri A})_2(\text{N}_3)(\text{CH}_2\text{O}_2)] \cdot (\text{H}_2\text{O})_6$ (**3**). Cobalt is six coordinated by four oxygen atoms [O(8), O(14), O(23) and O(29)] from two Tri A rings, in a bidentate fashion while other carboxylate uses full coordination mode and one nitrogen from azide and one oxygen from formic acid molecule. $[\text{Er}(\text{Tri A})_2(\text{DMF})_2] \cdot \text{Ethanol}$, (**4**) was synthesis by Hydrothermal method in which Cobalt is six coordinated by four oxygen atoms [O(8), O(14), O(23) and O(29)] from two Tri A rings in a conventional *O,O'*-bidentate fashion and two oxygen from DMF molecules. $[\text{Er}(\text{Tri A})_2(2,6 \text{ PDA})(\text{THF})_2] \cdot \text{Butanol}$, (**5**) Erbium is six coordinated by four oxygen atoms [O(8), O(14), O(23) and O(29)] from two Tri A rings in a conventional *O,O'*-bidentate fashion and one nitrogen from azide and one oxygen from formic acid molecules to generate ErO_6 octahedral geometry. Results of CHNS analysis have been in good agreement with the proposed structures while FT-IR spectroscopy also supports the binding of ligand with metal. Photo catalytic activity of complexes was also studied by using methylene blue dye. Cobalt complexes show excellent photochromic behavior at different temperature and in the presence different solvents.

Keywords: 5-Carboxyisophthalic acid, Cobalt, Erbium, Co-ligand, Hydrothermal, Reflux, Photocatalytic activity, Photochromic