Abstract

Lanthanide complexes have recently received considerable attention in the field of therapeutic and diagnostic medicines. Among many of their applications, lanthanides complexes are used as magnetic resonance imaging (MRI) contrast agents in clinical radiology and luminescent lanthanides for bio analysis, imaging and sensing. The coordination chemistry of lanthanide complexes showing biological applications is of recent origin. For the synthesis of coordination polymers, multidentate ligands are suitable, that contain several donor sites which allow the extension of polymeric structure in one, two or three directions. Among them, polycarboxylate ligands have received special attention.

Ligands under investigation (PDC, H_4DCTA), when reacted with lanthanides/transition metal salts in the absence of auxiliary ligands under hydrothermal conditions produce crystals of various morphologies. The Lanthanide (III) and transition metal complexes of nitrogen and oxygen donor ligands yielded solid crystalline complexes which were characterized by UV–Visible, FTIR, X-ray diffraction, and thermal analysis and screened for antimicrobial and antioxidant activity.

From the analytical data, the stoichiometry of the complexes has been found to be 1:4 (metal: ligand) which is supported by TGA, FT-IR and ultraviolet spectroscopy data. The X-ray diffraction data for gadolinium complex with pyridine-2,6-dicarboxylic acid suggest monoclinic crystal system with space group of $P2_1/c$. The geometry of resultant complex is pentagonal prismatic having two molecules of PDC coordinated in a tridentate manner through –(O—N—O)— donor group. One of the Gd^{3+} ions is coordinated by two O,N,O-tridentate PDC ligand molecules. This complex grew into one dimensional arrangement in [100] direction by coordinating through oxygen atoms of coordinated pyridine dicarboxylic acid. This complex showed a one dimensional polymeric structure due to bridging ability of pyridine-2,6-dicarboxylic acid through its oxygen atoms.

The biological assay (antibacterial and antioxidant) of these complexes exhibited a resilient antibacterial activity against gram negative bacterial species rather than gram positive species by penetrating through cellular membrane through hydrophilic nature of these complexes and while show a moderate antioxidant activities with respect to the reference compound due to their chelating effect.