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Design, Spectroscopic Characterization, Electrical Conductivity and Molecular Modelling Studies of Biologically Puissant Co(II) and Ni(II) Complexes of N,N'-bis(furan-2-ylmethyl)benzene-1,2-dicarboxamide

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A series of N,N'-bis(furan-2-ylmethyl)benzene-1,2-dicarboxamide ligand (L) based metal complexes of general composition $M(L_2)X_2$ [where M = Co(II), Ni(II), and L = ligand and X = Cl^-, CH_3COO^-] were synthesized by conventional and microwave irradiation synthesis methods. Both ligand and its metal complexes were characterized by elemental analysis, molar conductance, NMR (^1H and ^{13}C), thermal analysis (TGA), infrared, UV-*vis*, mass spectral and molecular modelling studies. The elemental composition data revealed that the metal to ligand molar ration is 1:2 in all synthesized complexes. The obtained spectroscopy results for synthesized complexes indicated that the ligand behaved as a bidentate ligand and agreed well with the proposed structures. The solid state electrical conductivity of the complexes was studied as a function of temperature, indicating the semiconducting nature of the metal complexes. In order to evaluate the antimicrobial activity of metal ions upon chelation, the newly synthesized ligand and its metal complexes were tested for their antibacterial and antifungal activities by the disk diffusion method. The antioxidant activity of the representative complex was evaluated by using 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging method. The antimicrobial and antioxidant activity results indicated that all metal complexes have been found to be more effective than the ligand as the process of chelation dominantly affects the overall biological behavior of the compounds.

Keywords: N,N'-bis(furan-2-ylmethyl)benzene-1,2-dicarboxamide; Co(II), Ni(II) complexes; Antimicrobial activities

FULL TEXT