

Synthesis, Characterization and Antibacterial Activity of Metalloporphyrins: Role of Central Metal Ion

Authors : Belete B. Beyene, Ayenew M. Mihirteu, Misganaw T. Ayana, Amogne W. Yibeltal

Abstract : Modification of synthetic porphyrins is one of the promising strategies in an attempt to get molecules with desired properties and applications. Here in, we report synthesis, photophysical characterization and antibacterial activity of 5, 10, 15, 20-tetrakis-(4- methoxy carbonyl phenyl) porphyrin M(II); where M = Co, Fe, Ni, Zn. Metallation of the ligand was confirmed by using UV-Vis spectroscopy and ESI-MS measurement, in which the number of Q bands in absorption spectra of the ligand decreased from four to one or two as a result of metal insertion to the porphyrin core. The antibacterial activity study of the complexes toward two Gram-positive (*Staphylococcus aureus* (*S. aureus*) and *Streptococcus pyogenes* (*S. pyogenes*)) and two Gram-negative (*Escherichia coli* (*E. coli*) and *Klebsiella pneumoniae* (*K. pneumoniae*)) bacteria by disc diffusion method showed a promising inhibitory activity. The complexes exhibited highest activities at highest concentration and were better than the activity of free base ligand, the salts, and blank solution. This could be explained on the basis of Overton's concept of cell permeability and Tweed's Chelation theory. An increased lipo-solubility enhances the penetration of the complexes into the lipid membrane and interferes with the normal activities of the bacteria. Our study, therefore, showed that the growth inhibitory effect of these metalloporphyrins is generally in order of ZnTPPCOOMe > NiTPPCOOMe > CoTPPCOOMe > FeTPPCOOMe, which may be attributed to the better lipophilicity and binding of the complex with the cellular components.

Keywords : porphyrins, metalloporphyrins, spectral property, antibacterial activity, synthesis

Conference Title : ICACCE 2024 : International Conference on Applied Chemistry and Chemical Engineering

Conference Location : Sydney, Australia

Conference Dates : August 29-30, 2024