

Oxidovanadium(IV) and Dioxidovanadium(V) Complexes: Efficient Catalyst for Peroxidase Mimetic Activity and Oxidation

Authors : Mannar R. Maurya, Bithika Sarkar, Fernando Avecilla

Abstract : Peroxidase activity is possibly successfully used for different industrial processes in medicine, chemical industry, food processing and agriculture. However, they bear some intrinsic drawback associated with denaturation by proteases, their special storage requisite and cost factor also. Now a day's artificial enzyme mimics are becoming a research interest because of their significant applications over conventional organic enzymes for ease of their preparation, low price and good stability in activity and overcome the drawbacks of natural enzymes e.g serine proteases. At present, a large number of artificial enzymes have been synthesized by assimilating a catalytic center into a variety of schiff base complexes, ligand-anchoring, supramolecular complexes, hematin, porphyrin, nanoparticles to mimic natural enzymes. Although in recent years a several number of vanadium complexes have been reported by a continuing increase in interest in bioinorganic chemistry. To our best of knowledge, the investigation of artificial enzyme mimics of vanadium complexes is very less explored. Recently, our group has reported synthetic vanadium schiff base complexes capable of mimicking peroxidases. Herein, we have synthesized monoidovanadium(IV) and dioxidovanadium(V) complexes of pyrazoleone derivatéis (extensively studied on account of their broad range of pharmacological appication). All these complexes are characterized by various spectroscopic techniques like FT-IR, UV-Visible, NMR (1H, 13C and 51V), Elemental analysis, thermal studies and single crystal analysis. The peroxidase mimic activity has been studied towards oxidation of pyrogallol to purpurogallin with hydrogen peroxide at pH 7 followed by measuring kinetic parameters. The Michaelis-Menten behavior shows an excellent catalytic activity over its natural counterparts, e.g. V-HPO and HRP. The obtained kinetic parameters (Vmax, Kcat) were also compared with peroxidase and haloperoxidase enzymes making it a promising mimic of peroxidase catalyst. Also, the catalytic activity has been studied towards the oxidation of 1-phenylethanol in presence of H₂O₂ as an oxidant. Various parameters such as amount of catalyst and oxidant, reaction time, reaction temperature and solvent have been taken into consideration to get maximum oxidative products of 1-phenylethanol.

Keywords : oxovanadium(IV)/dioxidovanadium(V) complexes, NMR spectroscopy, Crystal structure, peroxidase mimic activity towards oxidation of pyrogallol, Oxidation of 1-phenylethanol

Conference Title : ICCST 2016 : International Conference on Chemical Sciences and Technologies

Conference Location : Singapore, Singapore

Conference Dates : January 07-08, 2016