



Transition metal bis iminium complexes: Synthesis, characterization, and electrochemistry. Homogeneous epoxidation of cyclohexene with H₂O₂ using the oxovanadium complex as catalyst

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ABSTRACT

A series of mononuclear iron, manganese and oxovanadium complexes containing a tetradentate Schiff base ligand derived from 2-hydroxy-1-naphthaldehyde and 1,2-diaminoethane are prepared. The resulting products were characterized by elemental analysis, infrared, electronic absorption and molar conductance measurement. The complexes have been found to possess 1:1 metals to ligand stoichiometry and the molar conductance data revealed that the metal complexes were non-electrolytes. Molecular structure of the oxovanadium Schiff base complex, VOL, was determined by single-crystal X-ray diffraction. Cyclic voltammetry studies of complexes, investigated in DMF on a glassy carbon (GC) electrode under nitrogen atmosphere, revealed that all of the complexes showed a single electron quasi-reversible redox waves through diffusion controlled processes. The diffusion coefficients are determined using GC rotating disk electrode. The Levich plot, $I_{lim} = f(\omega^{1/2})$, was used to calculate the diffusion-convection controlled currents. The catalytic activity of the VOL complex in the epoxidation of cyclohexene, in the presence of hydrogen peroxide H₂O₂ as oxidant, was investigated using different reaction parameters such as temperature, alkene/oxidant ratio and the catalyst amount. The results showed that a conversion of 80.4% was obtained with the epoxide selectivity of 29% using a ratio of 1:4 of the cyclohexene:H₂O₂ (substrate:oxidant).

Keywords: Complexes; Schiff base; Crystal Structure; Cyclic Voltammetry; Diffusion; Epoxidation

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