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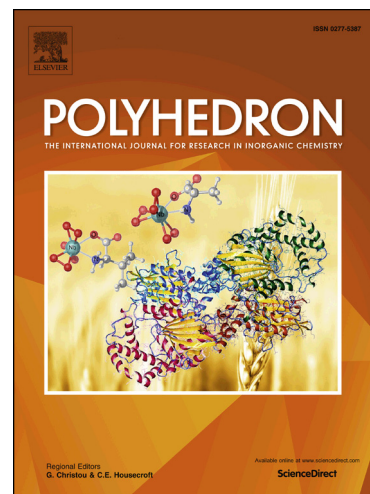
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Catalysis of Alkene Epoxidation by Manganese (II) and (III) Complexes of both Schiff base and Reduced Schiff base Ligands utilizing Environmentally Benign H₂O₂.

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Abstract:

Mono and disubstituted tridentate Schiff base ligands were synthesized from the reaction of 2(2-aminoethyl)pyridine with 5-bromosalicylaldehyde (H-L¹) and 3, 5-dibromosalicylaldehyde (H-L²) respectively, which were subsequently reacted with NaBH₄ to yield the corresponding reduced Schiff base ligands H-rL¹ and H-rL². The complexes; Mn^{III}-(L¹)₂ (1), Mn^{III}-(rL¹)₂ (3), and Mn^{II}-(L²)₂ (2), Mn^{II}-(rL²)₂ (4) were obtained by the reaction of the ligands with {Mn(ClO₄)₂.6H₂O}. The ligands and complexes were characterized by UV-Visible, ESI-MS and FT-IR spectroscopy. The ¹H NMR spectra of the ligands as well as the crystal structures, and electrochemical properties of the complexes were obtained. The crystal structures of Mn^{III}-(L¹)₂ and Mn^{II}-(L²)₂ show coordination of the ligands in tridentate mode in octahedral geometry. Cyclic voltammetric studies of Mn-(L¹)₂ and Mn-(L²)₂ in acetonitrile solution show two prominent reversible peaks attributed to the redox processes: Mn(II)/Mn(III), (E_{1/2} = 0.203 - (-0.204 V) and Mn(III)/Mn(IV), (E_{1/2} = 1.103 - 0.195 V) vs. Ag/AgCl while that of Mn-(rL⁴)₂ showed three quasi reversible peaks suggesting three redox couples: Mn(II)/Mn(III) (E_{1/2} = -0.109); Mn(III)/Mn(IV), (E_{1/2} = 0.125 and (Mn(IV)/Mn(V), (E_{1/2} = 0.649) vs Ag/AgCl. Epoxidation of cyclohexene and 1-hexene by hydrogen peroxide catalyzed by the manganese complexes gave epoxide yield of 42-53% with a turnover of 10.50-13.25 after 20 hours of reaction for the reduced Schiff base complexes {Mn^{III}-(rL¹)₂ and Mn^{II}-(rL²)₂} at 0°C.

Keywords: Schiff base, Reduced Schiff base, Manganese complexes, Co-catalysts, Epoxidation, Catalysis

1. Introduction

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