Catalytic oxidation of cyclohexane using transition metal complexes of dithiocarbazate schiff base

ABSTRACT

Metal complexes of dithiocarbazate Schiff bases (abbreviated as NiSMdiAP, CoSMdiAP, FeSMdiAP, MnSMdiAP and ZnSMdiAP, where SMdiAP represents the Schiff base) were synthesized and characterized using techniques including Fourier transform infrared spectroscopy, nuclear magnetic resonance, 1H NMR, 13C NMR, magnetic susceptibility measurements, molar conductivity, ultraviolet–visible spectroscopy, and inductively coupled plasma-optical emission spectrometry. The study focused on the oxidation of cyclohexane by using the metal complexes as catalysts with hydrogen peroxide as the oxidative source under special conditions. These catalysts showed good conversion and high selectivity compared to other Schiff base complexes. The conditions of the oxidation reaction catalysed by these complexes were investigated. Gas chromatography was used to analyse the products of the oxidation reaction of cyclohexane and it showed that cyclohexanol and cyclohexanone are the main products. A copper complex of Schiff base formed from 2,6-diacetyl pyridine and S-methyldithiocarbazate, [CuIISMdiAP] showed the highest level of activity during the screening studies towards cyclohexane oxidation. The time of reaction, temperature, and the concentration of H2O2 as an environmentally friendly oxidant and the catalyst type played an important role in the selectivity and conversion of cyclohexane oxidation. The selectivity of the reaction was 98%.

Keyword: Dithiocarbazate schiff bases; Metal complexes; Cyclohexane; Oxidation; Selectivity