

Preparation, spectroscopic, and electrochemical characterization of metal(II) complexes with Schiff base ligands derived from chitosan : correlations of redox potentials with Hammett parameters

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Abstract

The chitosan–(Fe(II), Co(II), and Cu(II)) complexes were prepared by mixing chitosan (Chi) powder with a salicylaldehyde (Sal, 5-hydrogen (–H)) and their 5-bromo (–Br), 5-chloro (–Cl), 5-methoxy (–OCH₃), 5-fluoro (–F), 5-methyl (–CH₃), and 5-nitro (–NO₂) derivatives (groups R) and mixing these with FeCl₂ and CuCl₂ in ethanol and with Co(CH₃COO)₂ solutions in butanol at 80 °C over 8 h in heterogeneous phase, followed by extraction with ethanol and butanol, respectively. The complexes were characterized by FTIR and UV–vis spectroscopy, elemental analysis, and cyclic voltammetry. A linear correlation between the metal formal potential *versus* the Hammett parameters of the substituents was observed. The electron-withdrawing groups shift the redox potential to positive values, as a result of lowering the energy of the highest occupied molecular orbital. The formal potential was used as a measurement for the driving force of chitosan complexes for redox reactions.

