Synthesis, Spectroscopic and Electrochemical Study of Mn(II) Complexes of N-methylbenzyl, Phenylpiperazyl- and Morpholinyl- dithiocarbamate

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Mn(II) complexes of N-methylbenzyl- (L_1), phenylpiperazyl- (L_2) and morpholinyl- (L_3) dithiocarbamates formulated as $[Mn(L_1)_2]$ **1**, $[Mn(L_2)_2]$ **2** and $[Mn(L_3)_2]$ **3** were synthesized and characterized by elemental analysis and spectroscopic techniques. The FTIR spectra confirmed the dithiocarbamate molecules coordinated the Mn(II) ion as bidentate chelating ligands by the single $\nu(C-S)$ bands observed in the range $940-994\text{ cm}^{-1}$ and the $\nu(C-N)$ stretching vibrations observed in the region $1462-1483\text{ cm}^{-1}$. The EPR studies of the compounds showed broad signals for complexes **1** and **3** with g values of 2.223 and 2.164 at $25\text{ }^\circ\text{C}$ and 2.005 and 2.013 at $-196\text{ }^\circ\text{C}$ respectively and hyperfine coupling constant (A) of 98.65 and 84.64 G respectively. Complex **2** showed six lines hyperfine splitting typical of ^{55}Mn nucleus, with g values of 2.144 and 2.082 at $25\text{ }^\circ\text{C}$ and $-196\text{ }^\circ\text{C}$ respectively and hyperfine coupling constant of 93.47. The electrochemical studies of the complexes revealed two redox couples for complexes **1** and **3** at a potential range of -0.4 to 0.5 V and -0.29 to 0.42 V respectively with each redox couple associated with a sequential single electron transfer process corresponding to the Mn^{II}/Mn^{III} and Mn^{III}/Mn^{IV} metal center redox process. Complex **1** exhibited one redox couple at 0.5 to 1.2 V potential corresponding to metal center Mn^{II}/Mn^{III} redox process. All the complexes exhibited diffusion controlled behaviour at increase scan with the ratio of cathodic to anodic peak current approximately a unity.

Keywords: Manganese(II); dithiocarbamates; spectroscopy; electrochemistry; cyclic voltammetry.

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