

Synthesis, Spectroscopic Investigation and Biological Activity of Encapsulated Metal(II/III) Complexes

Moshira M. Abd El-Wahed^{1*}, Abdou S. El-Tabl²

¹ Department of Chemistry, Faculty of Science, Menoufia University, Shebin El-Kom, Egypt.

E-mail: mmawahed@yahoo.com

² Department of Pathology, Faculty of Medicine, Menoufia University, Shebin El-Kom, Egypt

A new series of manganese(II), iron(III) and cobalt(III) Complexes of 14-membered macrocyclic ligand, (3.6.10.13,16,19-hexadentate bicycle(6.6.6)cosane) have been prepared and characterized by elemental analyses, IR, UV-VIS, ¹H- and ¹³C- NMR spectra, X-ray single crystal (Cobalt(III) complex) magnetic susceptibilities, conductivities, and ESR measurements. Molar conductance measurements in DMF solution indicate that, the complexes are electrolytes. The crystal structure of cobalt(III) complex confirms that, the synthesis occurs with retention of the chirality of the Co(en)₃³⁺ ion and show the hexadentate nature of the capsule with the tris-(methylene), second, each cobalt(III) atom is surrounded by six-nitrogen atoms belonging to the lattice to give octahedral geometry. The ESR spectra for cobalt (III) complex in CD₃OD+10%D₂O after exposure to ⁶⁰Co-γ-rays at 77 K using a 0.2217 M rad h⁻¹ vicrad source shows $g_1 > g_{||} > g_e$, indicating that, the unpaired electron site is mainly present in the d_{z²} orbital with covalent bond character. However, in solid state after exposure to ⁶⁰Co-γ-rays at 77 K shows $g_{||} > g_1 > g_e$, indicating that, the unpaired electron site is mainly present in the d_{x²-y²} ground state. Manganese (II) complex shows six isotropic lines characteristic to an unpaired electron interacting with a nucleus of spin 5/2, however, iron(III) complex shows spectrum of a high spin ⁵⁷Fe (I = 1/2), d⁵ configuration. On the basis of elemental analyses, IR, electronic and ESR spectral studies, an octahedral geometry has been assigned for the complexes. Cobalt (III) complex acts as a good electron capture reagent and has the ability to add to DNA molecules without any disruption of its native structure. It shows exploitation in reducing the amount of electron adducts formed in DNA during irradiation with low radiation products.