“Synthesis of bridged bimetallic complexes: Characterisation and physico-chemical studies

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There is increasing interest in binuclear complexes, which contain ligand structures capable of holding two metals centers in close proximity. These polymetallic systems are attractive as synthetic models of biomolecules. Several authors have sought to establish various criteria for judging the viability of a particular single-atom or polyatomic bridging unit to support a magnetic exchange interaction between two paramagnetic metal ions. The spectroscopic methods are widely used in the field of transition metal and organometallic chemistry. The techniques used in the investigation of the presently synthesized compound described in this work are as follows:

Ultra – violet and Visible (Ligand Field) spectroscopy, Infra - red spectroscopy, Nuclear magnetic resonance spectroscopy, Magnetic Susceptibility, Kinetic Study, Elemental analysis, Thermogravimetric analysis (TGA), Electron- spray ionization mass spectra

A new organylborate ligand, Potassium bis (succinyl) borate was synthesized as its potassium salt. The ligand was formed by the displacement of hydrogen of KBH_4 with succinic acid. It was converted into its cobalt (II), nickel (II), and copper (II) complexes. All the compounds are air stable, sparingly soluble in common organic solvents but soluble in H_2O, DMSO, and acetonitrile. The molar conductance measurements of complexes in water (10^{-3}M) correspond to be electrolytic nature for Co (II), Ni (II) and Cu (II). .The results of the elemental analyses and spectral studies are consistent with proposed composition of the ligand and its corresponding bimetallic complexes. The magnetic and electronic spectral studies of solid metal complexes suggest a square-planar geometry for the Cu (II) complexe and octahedral configurations for the other metal complexes, namely, Ni (II) and Co (II) ions. The resulting metal complexes enhanced the antimicrobial activity of the free ligand against all pathogenic strains.

Oxo- homoscorpionate borate ligand, Potassium bis (phthalato) borate was synthesized as its potassium salt. It was converted into its cobalt (II), nickel (II), and copper (II) complexes. The compounds were characterized by physical, elemental analysis and Spectroscopic characterization. The ligand was so designed that it can secure two metal ions in the close proximity. The magnetic and electronic spectral studies of solid metal complexes suggest a square-planar geometry for the Cu (II) complex and octahedral configurations for the other metal complexes, namely, Ni (II) and Co (II) ions. The magnetic susceptibility measurements of Cu (II), Ni (II) and Co (II) complexes reveal that these complexes exhibit antiferromagnetic coupling behavior due to presence of two metal ions in close proximity. The resulting metal complexes enhanced the antimicrobial activity of the free ligand against all pathogenic strains.

Thiourea is one of the simplest of the thio compound, has many industrial applications. Kinetics of MnO_4^--thiourea redox reaction in presence of cationic micelles of cetyltrimethylammonium bromide. Upon mixing aqueous solutions of permanganate and thiourea, a readily distinguishable brown colour appears and then disappears slowly. Various experiments have been performed to confirm the nature of brown colored solution. The effects of $[MnO_4^-]$, [thiourea] and $[H^+]$ on the reaction rate were determined in presence of CTAB. Absorbance of the reaction mixture increases with [CTAB] which suggest the incorporation/association of permanganate with the head group of CTAB micelles. Menger–Portnoy model was used to explain the effect of CTAB micelles.

Cr^{VI} oxidations provide kinetics with challenging mechanistic possibilities due to the ability of chromium to exist in a multitude of oxidation states. This chapter discuss the chromium (VI)-D-glucose redox system in presence of complexing agents. The reaction is first-order each in $[Cr^{VI}]$ and [D-glucose]. The kinetics reveals complex order dependence in $[HClO_4]$. The zero-order kinetics with respect to $[HClO_4]$ at low concentrations shifts to higher order at higher concentration. Ethylenediamminetetra acetic acid (EDTA) and 2, 2’-bipyridyl (bpy) catalyze the reaction whereas Mn^{II} has no effect. In the EDTA- and bpy-catalyzed paths, Cr^{VI}-EDTA and Cr^{VI}-bpy complexes have respectively been suggested as the active oxidant species.