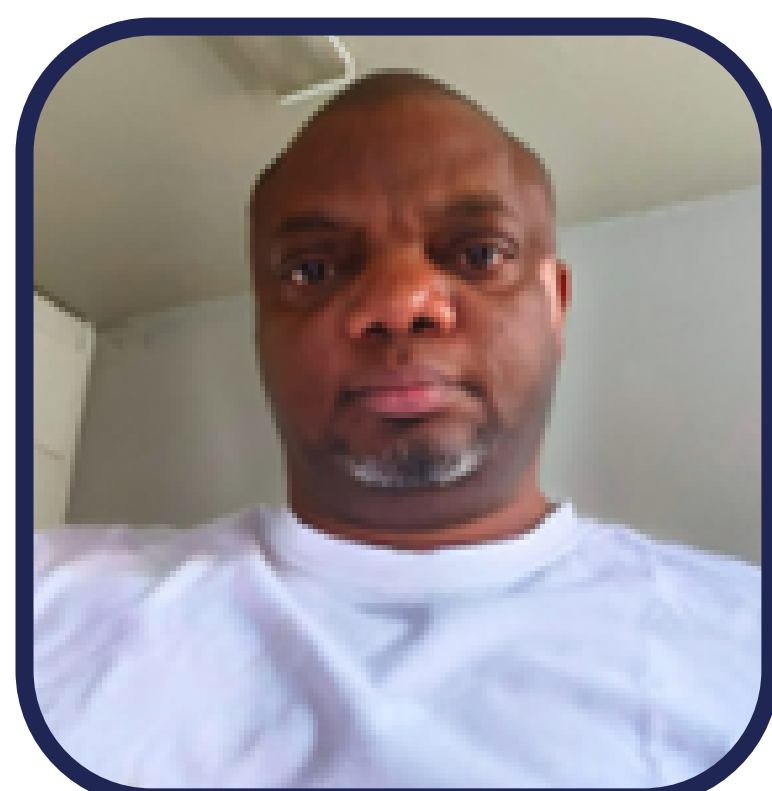


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Synthesis, characterization and electrochemical properties of ruthenium(II) complexes containing mono-, bipyridyl dicarboxylic acid and triphenylphosphine: Potential photosensitizers for photovoltaic dye-sensitized solar cells (DSSCs)

The syntheses of four new series of mixed ligand heteroleptic ruthenium(II) complexes containing 3,5-pyridyl dicarboxylic acid (dca) as the major monodentate ligand incorporated into bulky templates of monochloro-triphenylphosphine ruthenium(II) polypyridyl formulated as $\text{RuCl}(\text{PPh}_3)(\text{dca})(\text{H}_2\text{O})$, $\text{RuCl}(\text{PPh}_3)\text{Bpy}(\text{dca})$, $\text{RuCl}(\text{PPh}_3)\text{Hbpy}(\text{dca})$ and $\text{RuCl}(\text{PPh}_3)\text{Phen}(\text{dca})$ are reported. The complexes are prepared in a one-pot synthetic method and characterized by IR, UV-Vis, NMR (^1H & ^{31}P) spectroscopy, mass spectrometry, and their cyclic and square-wave voltammetry studied. In the electronic spectra measured in DMSO, there are three to four well-defined absorption peaks with appreciable high molar extinction coefficient in the UV-Vis regions between 265–560 nm assigned to the $\pi\text{-}\pi^*$ transitions, two ligand-to-ligand charge-transfer (LLCT) bands and $d\pi(\text{Ru})\text{-}\pi^*(\text{L})$ transitions. The redox properties of the complex solutions in acetonitrile towards oxidation are adduced to the presence of electron-donating ability of the carboxylic acid groups on the pyridine and/or polypyridine ring structures and triphenylphosphine moieties which may also possibly favour oxidation to Ru^{3+} , whereas electron-withdrawing characteristics due to the presence of a chloride atom is known for the contribution to stability of the Ru^{2+} complexes. The extended wavelength to the red region, high molar extinction coefficient, high emission intensity and electrochemical redox properties shown by the complexes endeared them as potentials photosensitizers in the dye-sensitized solar cells application.

Keywords: Mono-bipyridyl Ru(II) sensitizers, dicarboxylic acid, triphenylphosphine-chloride, molar extinction coefficient, photovoltaic cells, and cyclic voltammetry

Biography:

Prof. Adewale Olufunsho Adeloye, holds Ph.D. Chemistry (Inorganic), M.Phil. (Organic), M.Sc. (Pharmaceutical Chemistry). He was appointed Associate Professor of Chemistry by the Al-Farabi Kazakh National University, Almaty, Kazakhstan. Currently, he holds professorial Academic Associate position in the department of chemistry, (CSET), University of South Africa, Johannesburg, South Africa. He has published several outstanding academic articles in his fields of expertise: natural products chemistry, synthesis, organometallic and coordination chemistry. He has served in various capacities as science journal editorial board member, reviewer, external examiner, and academic curriculum development consultant. AD Scientific Index 2023 ranked him top 2% in his research fields.