

## Abstract

Three mixed-ligand metal-metal bonded complexes containing one unsymmetrical anionic bridging ligand were successfully synthesized and characterized as to their electrochemical and spectroscopic properties. The investigated mono-substituted diruthenium complexes have the general formula,  $\text{Ru}_2(\text{OAc})_3(\text{L})\text{Cl}$ , where  $\text{OAc}$  = acetate anion and  $\text{L}$  = anilinopyridinate bridging ligand (ap, 2-Meap, 2-Fap). UV/Visible spectroscopy studies reveal that the investigated diruthenium complexes exist in the forms  $\text{Ru}_2(\text{OAc})_3(\text{L})\text{Cl}$  and  $[\text{Ru}_2(\text{OAc})_3(\text{L})]^+$  in solution. The two forms are observed as a split band in the 500 – 700 nm visible region. A collapse of one band is seen upon reaction of the complexes with excess halide ( $\text{Cl}^-$ ,  $\text{Br}^-$ ) indicating an equilibrium shift towards the neutral species in solution, whereas a reaction with  $\text{AgBF}_4$  precipitates the chloride as the  $\text{AgCl}$  salt, leaving only the cationic species in solution. Electrochemical characterization of the mixed-ligand diruthenium complexes conclusively reveals a stable  $\text{Ru}_2^{5+}$  oxidation state in all three complexes. Upon an applied potential in a non-coordinating solvent, each complex undergoes a reversible one-electron oxidation and reduction process accessing the  $\text{Ru}_2^{6+}$ , and  $\text{Ru}_2^{4+}$  oxidation states respectively. The treatment of human breast adenocarcinoma MCF-7 cells with these water-soluble complexes results in a less than 50 % cell survival. This demonstrates significance of solubility in the development of metallodrugs for cancer treatment.

