

Biomolecular Interaction of Ruthenium(II) Polypyridyl Complexes

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Abstract : A series of ruthenium(II) complexes, including two novel compounds $[\text{Ru}(\text{dppz})_2(\text{L})]^{2+}$ where dppz = dipyrindo-[3,2-a:2',3'-c]phenazine, and L = 2-phenylimidazo[4,5-f][1,10]phenanthroline (PIP) or 2-(4-hydroxyphenyl)imidazo[4,5-f][1,10]phenanthroline (p-HPIP) have been synthesized and characterized. The previously reported complexes $[\text{Ru}(\text{bpy})_2\text{L}]^{2+}$ and $[\text{Ru}(\text{phen})_2\text{L}]^{2+}$ were also prepared. All complexes were characterized by elemental analysis, $^1\text{H-NMR}$ spectroscopy, ESI-Mass spectroscopy and FT-IR spectroscopy. The photophysical properties were analyzed by UV-Visible spectroscopy and fluorescence spectroscopy. $[\text{Ru}(\text{dppz})_2(\text{PIP})]^{2+}$ and $[\text{Ru}(\text{dppz})_2(\text{p-HPIP})]^{2+}$ displayed 'molecular light-switch' effect as they have high emission in acetonitrile but no emission in water. The cytotoxicity of all complexes against cancer cell lines Hela and MCF-7 were investigated through standard MTT assay. $[\text{Ru}(\text{dppz})_2(\text{PIP})]^{2+}$ showed moderate toxicity on both MCF-7 and Hela with IC_{50} of 37.64 μM and 28.02 μM , respectively. Interestingly, $[\text{Ru}(\text{dppz})_2(\text{p-HPIP})]^{2+}$ exhibited remarkable cytotoxicity results with IC_{50} of 13.52 μM on Hela and 11.63 μM on MCF-7 cell lines which are comparable to the infamous anti-cancer drug, cisplatin. The cytotoxicity of this complex series increased as the ligands size extended in order of $[\text{Ru}(\text{bpy})_2(\text{L})]^{2+} < [\text{Ru}(\text{phen})_2(\text{L})]^{2+} < [\text{Ru}(\text{dppz})_2(\text{L})]^{2+}$.

Keywords : ruthenium, cytotoxicity, molecular light-switch, anticancer

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