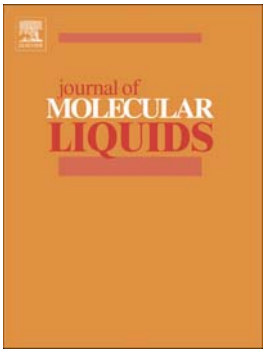

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Synthesis, physicochemical characterization and anticancer screening of sulfa drug ruthenium complexes as anticancer agent

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Abstract

A new five complexes of ruthenium(III) sulfa drug compounds (sulfanilamide, SD1; sulfacetamide sodium; SD2; sulfadiazine, SD3; sulfamethoxazole, SD4; and sulfadimidine, SD5) were synthesized with Ru:SD_n molar ratio of 1:2. The ruthenium(III) complexes were characterized by elemental analyses, IR, UV-vis. spectra, magnetic and thermal instruments. The results of the molar conductance measurements reveal that all the complexes have an electrolytic behavior. The infrared spectra show that the sulfa drug ligands (SD1, SD3, SD4 and SD5) act as a monobasic bidentate chelate through both nitrogen atoms of the anilino and sulfonamido groups. On the other hand, the SD2 ligand acts as monodentate toward Ru(III) ion via nitrogen atom of aniline group only because of sulfonamido group is deprotonated by sodium(I) ion. The spectroscopic results suggest octahedral geometry for all Ru(III) complexes. The molecular structures of the SD_n ligands were also discussed using quantum chemical calculations. The kinetic thermodynamic parameters of the essential DTG_{max} decomposition steps were calculated. The images of scanning electron microscopy (SEM) and transmittance electron microscopy (TEM) show amorphous appearance for all Ru(III) complexes except for SD3 complex of a nano-sized structure that confirmed by the X-ray powder diffraction (XRD) patterns. The electron density and the defect structure of the ruthenium(III) complexes were investigated using the positron annihilation lifetime technique. The antimicrobial activities (bacteria and fungi) of the Ru(III) complexes were assessed in comparison with standers. The evaluation of cytotoxicity of Ru(III) complexes against HCT-116 cell line were performed.

Key words: Ruthenium(III) ion; sulfa drug; chelation; anticancer; Positron annihilation lifetime spectroscopy

Introduction