

Spectroscopic, Molecular Structural, Thermal, Biological, and Voltammetric Characterization of Ru³⁺, Pt⁴⁺ and Ir³⁺ Complexes of Lomefloxacin Drug

Khuloud A. ALIBRAHIM¹, Foziah A. AL-SAIF¹, M.T. ALGHAMDI²,
M.S. EL-SHAHAWI^{2,3}, Khaled ALTHUBEITI⁴ Enas ALJUHANI⁵ & Moamen S. REFAT^{1,4,6}*

¹ College of Science, Princess Nourah bint Abdulrahman University, Department of Chemistry, KSA

² Department of Chemistry, Faculty of Science, King Abdulaziz University,
Jeddah, P.O. Box 80203, Saudi Arabia

³ Department of Chemistry, Faculty of Science, Damietta University, New Damietta Damietta, Egypt

⁴ Department of Chemistry, Faculty of Science, Taif University,
Al-Hawiah, Taif, P.O. Box 888 Zip Code 21974, Saudi Arabia

⁵ Department of Chemistry, Faculty of Applied Science, Umm Al-Qura University,
Makkah, P.O. 9168 Zip Code 21955, Saudi Arabia

⁶ Department of Chemistry, Faculty of Science, Port Said University, Port Said, Egypt

SUMMARY. This study reports the preparation and characterization of Ru³⁺, Pt⁴⁺ and Ir³⁺ complexes of lomefloxacin (LOM; (RS)-1-ethyl-6,8-difluoro-7-(3-methylpiperazin-1-yl)-4-oxo-quinoline-3-carboxylic acid). The complexes were characterized using elemental analyses (C, H, and N), molar conductance, IR, UV-Vis, magnetic moment, ¹H-NMR, X-ray powder diffraction, scanning electron microscopy, transmittance electron microscopy and thermogravimetric analyses. The infrared and UV-Vis spectra of LOM metal chelations with their different interligand transitions are fully assigned. LOM behaves as a neutral monodentate ligand complexed to the metal ions via the piperazine-N moiety and the complexes have octahedral geometrical structures. Molar conductance data reveal that all of these chelates are non electrolytes with 1:3 molar ratio for Ru(III) and Ir(III) chelates to LOM whereas, Pt(IV) with LOM ligand has a 1:2 molar ratio. The complexes of LOM have the general formulas [M(L)_n(Cl)_x].yH₂O (1) M = Ru³⁺, L: LOM: NH₄, n = 3, x = 3, y = 3; (2) M = Pt⁴⁺, L: LOM-NH₄, n = 2, x = 4, y = 4 and (3) M = Ir³⁺, L: LOM-NH₄, n = 3, x = 3, y = 3. X-ray powder diffraction is used as tool to estimate the crystallinity of coordination compounds as well as to inform about their geometrical structures. Thermogravimetric analysis (TG-DTG) was utilized to differentiate between coordinated and hydrated water molecules. The thermal behavior of LOM complexes was investigated and the thermal decomposition pathways have been postulated showing that the final product is metal oxide.

RESUMEN. Este estudio informa sobre la preparación y caracterización de los complejos Ru³⁺, Pt⁴⁺ e Ir³⁺ de lomefloxacin (LOM; (RS)-1-etil-6,8-difluoro-7-(3-metilpiperazin-1-il)-4-oxo-quinolina-3-carboxílico). Los complejos se caracterizaron mediante análisis elementales (C, H y N), conductancia molar, IR, UV-Vis, momento magnético, ¹H-NMR, difracción de rayos X en polvo, microscopía electrónica de barrido, microscopía electrónica de transmitancia y análisis termogravimétricos. Los espectros infrarrojo y UV-Vis de las quelaciones de metales de LOM con sus diferentes transiciones interligandas están completamente asignados. La LOM se comporta como un ligando monodentado neutro complejoado con los iones metálicos a través del resto piperazina-N y los complejos tienen estructuras geométricas octaédricas. Los datos de conductancia molar revelan que todos estos quelatos son no electrolitos con una relación molar de 1:3 para los quelatos de Ru(III) e Ir(III) con respecto a LOM, mientras que Pt(IV) con ligando de LOM tiene una relación molar de 1:2. Los complejos de LOM tienen las fórmulas generales [M(L)_n(Cl)_x].yH₂O (1) M = Ru³⁺, L: LOM: NH₄, n = 3, x = 3, y = 3; (2) M = Pt⁴⁺, L: LOM-NH₄, n = 2, x = 4, y = 4 and (3) M = Ir³⁺, L: LOM-NH₄, n = 3, x = 3, y = 3. La difracción con rayos X de polvo se usa como herramienta para estimar la cristalinidad de los compuestos de coordinación, así como para informar sobre sus estructuras geométricas. Se utilizó el análisis termogravimétrico (TG-DTG) para diferenciar entre moléculas de agua coordinadas e hidratadas. Se investigó el comportamiento térmico de los complejos de LOM y se han postulado las vías de descomposición térmica mostrando que el producto final es un óxido de metal.

KEY WORDS: biological activity, complexes, electrochemical characterization, lomefloxacin, Ru³⁺, Pt⁴⁺, and Ir³⁺, spectroscopic.

* Author to whom correspondence should be addressed. E-mail: msrefat@yahoo.com