

Synthesis, characterisation and ion-binding properties of oxathiacrown ethers appended to [Ru(bpy)₂]²⁺. Selectivity towards Hg²⁺, Cd²⁺ and Pb²⁺

Ruth A. Odhiambo,^{ab} **Austin O. Aluoch**,^{d*} Lydia W. Njenga,^a Stanley M. Kagwanja,^c
Shem O. Wandiga^a and Ola F. Wendt^{*b}

^a University of Nairobi, ^b Lund University, ^c Chuka University, ^{d*} **The Technical University of Kenya,**

ABSTRACT

A series of complexes with oxathiacrown ethers appended to a [Ru(bpy)₂]²⁺ moiety have been synthesized and characterised using ¹H NMR, ¹³C NMR, IR, electronic absorption and emission spectroscopies, mass spectrometry and elemental analyses. The complexes exhibit strong MLCT luminescence bands in the range 608–611 nm and one reversible metal centred oxidation potential in the range 1.00–1.02 V. Their selectivity and sensitivity towards Hg²⁺, Cd²⁺ and Pb²⁺ metal ions have been investigated using electronic absorption, luminescence, cyclic and differential pulse voltammetry titrations. Their responses towards selected cations and anions have also been investigated using electronic absorption and luminescence. While the complexes are selective towards Hg²⁺ and Cd²⁺ ions, none of them is selective towards Pb²⁺ ions. In particular, complex 2 gives a selective change in the UV/Vis absorbance with Hg²⁺ making it possible to detect mercury down to a detection limit of 68 ppm. The binding constants and limits of detection of the complexes have been calculated, with values ranging from 4.37 to 5.38 and 1.4 × 10⁻³ to 6.8 × 10⁻⁵ for log [thin space (1/6-em)] K_s and LOD respectively.

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