Kinetic and mechanistic studies of cisplatin analogues bearing 2,2′-dipyridylalkylamine ligands

Author(s)
Grace Kinunda, Deogratius Jaganyi

Abstract

A series of mononuclear Pt(II) complexes of the type diaqua(2,2′-dipyridylalkylamine)platinum(II) (where the alkyl group = methyl, ethyl, propyl, butyl or hexyl) were synthesized to investigate their nucleophilic substitution behaviour and the influence of the alkyl chain bonded to the tertiary nitrogen atom joining the two pyridine rings on the reactivity of the chosen complexes. The trend in rate constant shows that introduction of the σ-donating alkyl chain on the tertiary nitrogen joining the two pyridine moieties reduces the π-acceptor ability of the *cis* coordinated pyridine rings resulting in a less reactive Pt(II) centre which causes a decrease in the reaction rate. This is well supported by data from DFT calculations. It is also evident that the alkyl chain also introduces a steric effect which blocks the approach of the nucleophile to the Pt(II) centre. The boat-like structure of the six-membered chelate ring also contributes to the steric effect. The study has also shown that two substitution processes going through an associative mode of activation are observed. The first is the simultaneous substitution of the two aqua ligands, and the second is due to the dechelation of the ligand, an indication of possible disintegration of the complex if used as a drug.