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Research Articles

Synthesis, characterization, crystal structure and anticancer study of symmetrical binuclear bis-*N*-heterocyclic carbene silver(I) complexes

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Abstract

The synthesis of binuclear silver(I)-NHC complexes from bis-benzimidazolium salts and silver(I) ions has been carried out *via* an *in-situ* deprotonation (NHC = *N*-heterocyclic carbene). The reaction between 1,3-dibromopropane and two moles of *N*-substituted alkyl benzimidazole (R = methyl, hexyl, heptyl, octyl, and 4-methyl-benzyl) resulted in the formation of bis-benzimidazolium salts, $H_2L{\cdot}2Br^-$ (1–5). Subsequent reactions of the respective salts with excess Ag_2O yielded the formation of bis-NHC binuclear silver(I) complexes with the formula of $[Ag_2L_2]{\cdot}2PF_6$ (Ag1-Ag5). All compounds were characterized by ^1H and ^{13}C NMR, FTIR, elemental analysis, molar conductivity measurement, melting point analysis, and solubility tests. Single crystal X-ray crystallography data reveals that Ag2 exists as a dinuclear complex with no significant intramolecular argentophilic interactions. Anticancer studies of salts 1-5 and complexes Ag1-Ag5 were carried out by employing breast cancer cell lines (MCF-7). None of the salts showed antiproliferative activity, while all the complexes possessed significant anticancer properties in a dose-dependent manner. The complexes indicate better activity than a positive control except for Ag4.