Synthesis and Photophysical Characterization of Novel Heterometallic Gold(I)-Copper(I) Complexes

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Abstract

The strategic selection of chromophores and their coordination with metal centers has a substantial impact on the emission characteristics of luminous materials. This study investigates the creative development and synthesis of a heterometallic complex that showcases a unique chromophore (2-ethynyltriphenylene), it is chosen due to its robust π-conjugation and inflexible planar structure, which greatly boost its capacity to absorb light and impact emission characteristics [1]. The chromophore is chemically bonded to a gold(I) core attached to a strong ligand, diphenylpyridine phosphine, which not only stabilizes the gold(I) center, but also enhances efficient electrical communication between the gold and copper centers due to its electron-donating properties and structural adaptability [2]. We examined the photophysical consequences of combining this gold(I) complex with five different copper(I) salts: $Cu(MeCN)_4PF_6$, $Cu(MeCN)_4OTF$, $Cu(MeCN)_4BF_4$, CuCl, and CuI, that enable the creation of diverse coordination environments and impact the photophysical characteristics of the complexes through metallophilic interactions[3]. The heterometallic assemblies underwent thorough characterization utilizing several techniques including NMR, FTIR, ESI-MS, X-ray crystallography, and various spectrophotometric techniques in solution, solid and matrices (PMMA, PS). This work offers an understanding of how changes in the copper(I) counterions affect the luminous characteristics of the complexes. It emphasizes the possibility of adjusting these characteristics by selecting the metal centers and their organic ligands with caution. This study adds to the overall comprehension of the connections between the structure and properties of heterometallic luminous complexes, which will facilitate specific improvements in optoelectronic applications.

Keywords: Heterometallic complexes, Luminescence, Au(I)-Cu(I) complexes, Metallophilic interactions

Reference:

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