Acridine and 9-phenyl acridine Based Two Coordinated Luminescent Copper(I) N-Heterocyclic Carbene Complexes

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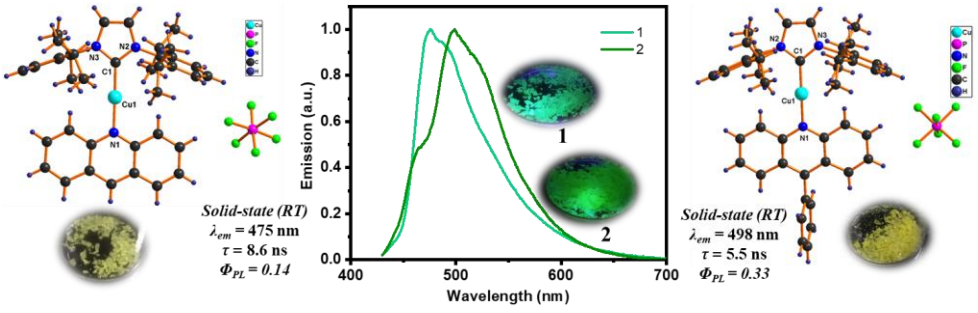
Iridium and platinum-based organometallic compounds are mainly utilised in the field of organic light-emitting diode (OLED) applications. However, several drawbacks of prototypical justify the continuing efforts to explore new avenues of luminescent metal compounds. Their respective d^6 or d^8 electron configuration can lead to the thermal population of metal-centred (MC) d-d* states that foster premature nonradiative decay, a problem which is particularly pronounced for ^{3}MLCT (metal-to-ligand charge transfer) states emitting in the high energy blue region. In addition, only a limited tunability is available due to the fixed octahedral or square-planar geometries, respectively, and not only from an intellectual point of view but also because of sustainability issues concerning mass market use of these rare elements it appears as a wise decision to look for alternatives. Hence, copper(I) complexes have gained increasing attention within the past decade because of the high abundance of this 3d element, MC transitions are absent in their d^{10} electron configuration, and the flexible coordination geometries ranging from tetrahedral to trigonal and linear have led to the discovery of highly interesting photophysical phenomena. Especially N-heterocyclic carbene-based copper complexes have a strong metal-ligand and steric hindrance of N-aryl substituents to provide stability also anionic carbazole derivative and neutral N-heteroaromatic ligands replace the halides in the simple halide coordinated Cu(I)-NHC to form the phosphorescent or thermally activated delayed fluorescence (TADF) Cu(I)-NHC complexes. We have synthesized and characterized acridine and 9-phenyl acridine based on two coordinated Cu(I)-NHC complexes. These two coordinated complexes adopted the linear geometry also imidazole ring co-planar with acridine/9-phenyl acridine derivatives. In the photophysical studies, both compounds show blue emissions in the methanol solution and green emissions in the solid state with a quantum yield of up to 33% in nanosecond lifetime, indicative of singlet states being involved.



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