Effects of Molecular Structure and Aggregated Structure on Photophysical Properties of Rod-Like Gold(I) Complex

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Keywords: *Gold Complex, Luminescence, Aggregation Induced Emission*

Organic molecules which exhibit strong emission in the solid state are increasingly attractive practically for their major roles in the field of materials chemistry and life sciences. Typical organic chromophores are strongly emissive in the dilute solution; however, the emission will be diminished in the concentrated solution or in the solid state because of collisional interaction between molecules. In the past two decades, organic materials in which the aggregation of the molecule enhances the radiative decay of excited states have been developed; this phenomenon termed as aggregation-induced emission (AIE).[1] We have reported that gold(I) complexes showed AIE behavior triggered by the aurophilic interaction, and their luminescence properties were highly sensitive to not only the molecular structure but also the structure of molecular aggregates.[2]

In the present study, a family of rod-like Au complexes showing liquid-crystalline phase were prepared (Figure 1), and their photophysical properties were investigated. All complexes showed strong emission in the crystal, but only weak emission can be observed in the solution; meaning that the reporting Au complexes are AIEgens. We found that the Au complexes exhibited room temperature phosphorescence with a relatively high quantum yield (>22%) in the crystal.

Interestingly, the complex bearing cyclohexylphenyl group (**CP-I5**) exhibited an excitation-wavelength dependence in the luminescence spectra, and a new emission band appeared in a shorter wavelength region by excitation at 290 nm. Detailed mechanism of luminescence of those Au complexes in the condensed phases is discussed.

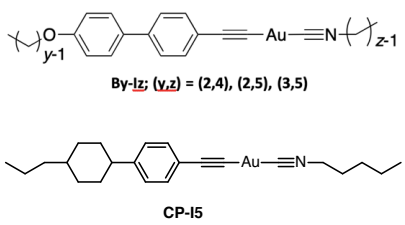

Figure 1. Molecular structures of gold complexes used in this study

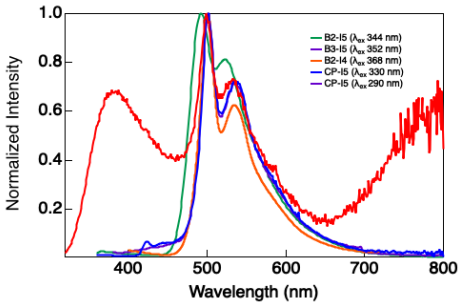

Figure 2. Emission spectra of gold complexes in the crystal

1) J. Mei, N.L.C. Leung, R.T.K. Kwok, J.W.Y. Lam, B.Z. Tang, *Chem. Rev.*, **2015**, 115, 21, 11718.
2) S. Yamada, Y. Rokusha, R. Kawano, K. Fujisawa, and O. Tsutsumi, *Faraday Discuss.*, **2017**, 196, 269