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Perhalophenyl Gold(I) complexes and their fascinating photophysics: luminescent solvatochromism and TADF examples

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One of the most interesting properties that perhalophenyl gold(I) complexes show is their luminescent behaviour. Its origin has different possibilities such as: i) the presence of Au(I)···M (M = closed shell metal) metallophillic interactions or ii) the geometry of the gold centre, among others. In this communication, examples of both situations are represented:
It is well-known the tendency of Au(I) centres to generate metallophilic interactions with a large number of closed-shell metals,[1] especially the ones from group 11. In this sense, an acid-base reaction between bisperhalophenylaurate units and silver salts has been very productive in order to obtain heterometallic gold(I) complexes displaying, at the same time, unsupported Au(I)···Ag(I) and Au(I)···Au(I) interactions. Using these compounds as starting material and pyridazine as ligand, it is possible to obtain stimuli-responsive heterometallic Au(I)-Ag(I) clusters based on its reversible solvatochromism luminescence behaviour induced by the nature of the solvent.
On the other hand, tricoordinated Au(I) complexes represent another possibility to obtain luminescent complexes through the simple control of the coordination environment of gold.[2] In addition, we have observed that structurally rigid perhalophenyl gold(I) complexes coordinated to chelating diphosphine ligands display Thermally Activated Delayed Fluorescence (TADF). The photophysical properties of the synthesized complexes have been studied in depth.

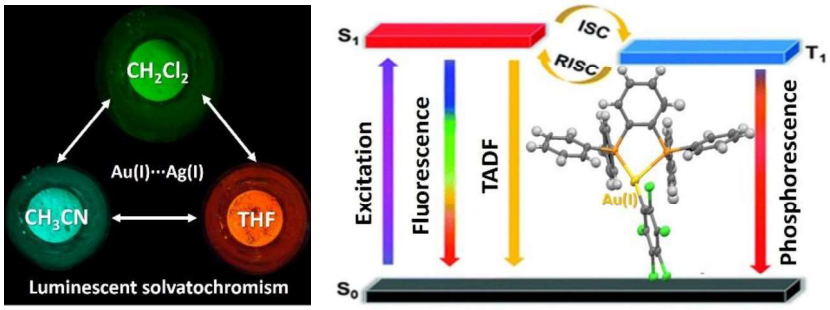

Figure 1. Luminescent solvatochromism based on metallophilic interactions (left) and tricoordinated Au(I) complex displaying TADF (right).

[1] V.W. Yam, V. K.-M. Au, S. Y.-L. Leung, *Chem.Rev.* **2015**, *115*, 7589-7728.
[2] M. Osawa, M. Aino, T. Nagakura, M. Hoshino, Y. Tanaka, M. Akita, *Dalton Trans.* **2018**, *47*, 8229-8239.