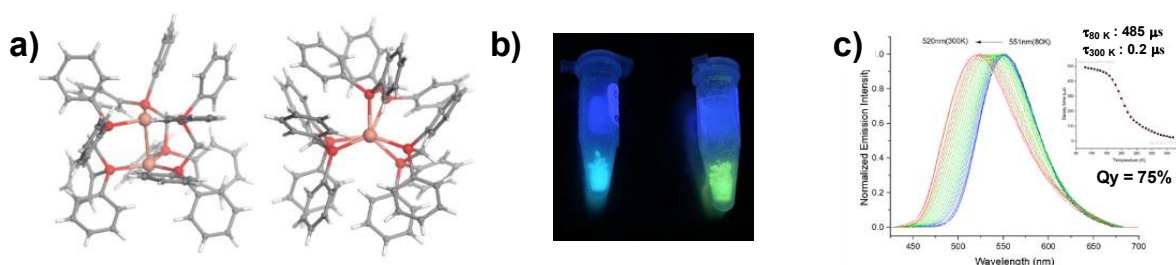


## Strategies for Tuning Solid-State Photophysical Emission in Bimetallic Cu(I) Complexes: Ligand Structure and Counterion Variations

Adrien Schlachter,<sup>a</sup> Chendong Xu,<sup>a</sup> Guillaume Calvez,<sup>a</sup> Karine Costuas,<sup>a</sup> Marsel Shafikoff,<sup>b</sup> Hartmut Yersin,<sup>b</sup> Manfred Scheer<sup>b</sup> and Christophe Lescop<sup>a</sup>

<sup>a</sup> ISCR -CNRS UMR 6226, INSA Rennes, Univ. Rennes 1, F-35000 Rennes, France <sup>b</sup> Institut für Anorganische Chemie der Universität Regensburg, 93040 Regensburg, Germany

Copper as a strategic resource is abundant, cheap, presents a low toxicity and is readily accessible. The combination of copper(I) ions with donor ligands can allow the obtention of molecular and supramolecular polymetallic structures with attractive luminescence properties such as wide range of emitted light colours and various emissions intensities. These properties are adjustable by controlling the electronic environment around the metal centres. This adaptability allows a strong potential for innovation in devices such as OLED (organic light-emitting diodes) solar cells, but also luminescent sensors [1]. By using chelating diphosphine ligands and copper(I) salts, four new homoleptic bimetallic Cu(I) complexes **D1-4** were obtained displaying original “propeller shape” structure. The variation of the nature of the chelating diphosphine ligands (bis(diphenylphosphino)methane vs bis(diphenylphosphino)amine) as well as the nature of the copper(I) counter anion (PF<sub>6</sub><sup>-</sup>, BF<sub>4</sub><sup>-</sup> or [Al{OC(CF<sub>3</sub>)<sub>3</sub>]<sub>4</sub><sup>-</sup>) allow to observe changes in the copper-copper intermetallic distance and the general electronic density of the resulting structure. What might seem as innocent changes at first, resulted in the observation of rich luminescent properties in the solid state, including high quantum yield, and TADF behaviour. Finally, we embedded **D1-4** in polymer matrix to further study their processability in order to getting closer to their implementation in devices.



**Fig. 1** a) Views of the X-ray structure of the derivative **D1**, b) Photographs of **D1** and **D2** sample under UV-vis light, c) Normalized solid-state temperature dependent emission spectra of **D2** and plot of the emission decay lifetime against temperature.

### References :

- [1] (a) V. W. Yam, V. K. Au, *Chem. Rev.* **2015**, *115*, 7589–7728. (b) R. Czerwieniec, M. J. Leitl, H. H. Homeier, H. Yersin, *Coord. Chem. Rev.* **2016**, *325*, 2–28. (c) S. Perruchas, *Dalton Trans.* **2021**, *2021*, 12031–12044. (d) C. Lescop, *Chem. Rec.* **2021**, *21*, 544–557.

