Gold Under Pressure and Cold: Mechanically and Thermally Tunable Luminescence

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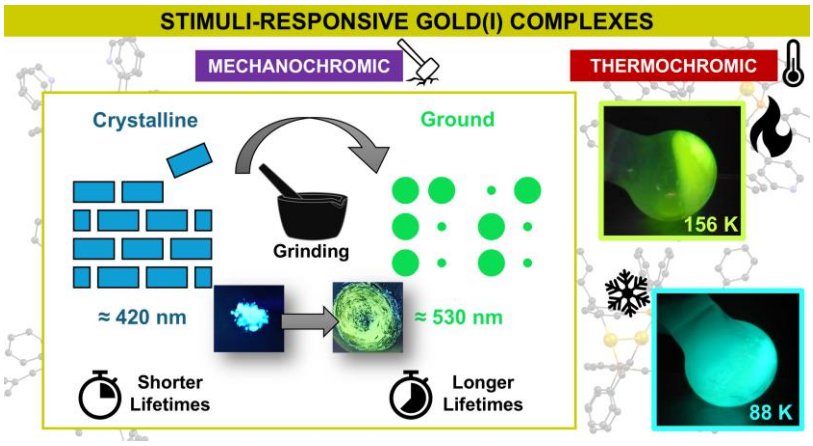
Mechanochromic materials that change colour in response to mechanical stimuli hold promise for applications in sensors, data storage, and smart materials.[1] Here we report the mechanochromic and thermochromic behaviour of a systematic isostructural series of gold(I) ethynyl-pyridine complexes, where the position of the pyridine nitrogen atom is varied and compared to a phenyl analogue.[2] All compounds display striking luminescence changes upon mechanical grinding and thermal treatment, with emission consistently shifting to a common green state (520–540 nm). These transformations are reversible upon solvent-vapour exposure and are also retained in PMMA films. Structural (PXRD) and photophysical analyses reveal that these spectral shifts arise from packing-dependent modulation of two accessible excited-state pathways: a higher-energy ILCT state and a lower-energy state whose stabilization is highly sensitive to aurophilic aggregation and local microstructure. Mechanical grinding disrupts long-range order and generates disordered microdomains that favour this aggregated CT-type excited state and enhance its radiative efficiency, accounting for the strong green mechanochromism. These results demonstrate how subtle ligand variations can direct supramolecular packing and excited-state balance to achieve robust, reversible chromic responses, providing general design principles for next-generation stimuli-responsive Au(I) luminescent materials.[3]



Acknowledgements: Projects PID2022-136861NB-I00 and PID2023-148453NB-I00, funded by MICIU/AEI/10.13039/501100011033 and Gobierno de Aragón (Research Group E07_23R). This article is based upon work from COST Action CA22131, LUCES Supramolecular LUminescent Chemosensors for Environmental Security, supported by COST (European Cooperation in Science and Technology). J. C. Pérez-Sánchez also thanks MICIU for a predoctoral grant (FPU21/01888).

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