Ultra-long room temperature phosphorescence of indium-based organic inorganic metal halide

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A study published in the journal *Science China Chemistry* found that $PBA_3[InCl_6]·H_2O$ exhibits a special "herringbone" stacking mode that enables abundant weak interactions between organic ligands and metal halide units. While the light source with 420 nm wavelength is used for excitation, the crystals preferentially display the ultra-long triplet phosphorescent emission with 290.4 ms lifetime decay.

"DFT calculation shows that $PBA_3[InCl_6]·H_2O$ is a direct band gap semiconductor. Due to the abundant weak interactions between metal octahedral and organics in the crystal, there is an energy or electron transfer between the inorganic anions and organic cations during the photo-excitation process. The $[InCl_6]^{3-}$ octahedron helps to stabilize the triplet excitons prompting the production of extra-long phosphorescence with more than 7 s to the naked eye," Tian says.

By designing patterns for encryption systems, the material further demonstrates the potential of the field of information encryption. It is worth mentioning that $PBA_3[InCl_6]·H_2O$ also has excellent stability in the air environment, laying the foundation for various commercial applications in the future.

This study was led by Prof. Hongbing Fu and Prof. Yang Tian (Department of Chemistry, Capital Normal University). The experiments were performed by an Edinburgh FLS-1000 fluorescence spectrometer combined with theoretical calculations.

More information: Heng Yu et al, Ultra-long room temperature phosphorescence of indium-based organic inorganic metal halides for naked-eye-visible afterglow, *Science China Chemistry* (2023). DOI: 10.1007/s11426-023-1721-4

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