Invited Lecture

Functionalization of anthracene-based solid-state photoluminescence sensors

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Solid-state luminescent materials based on pure fluorescent organic molecules have received considerable attention due to their potential applications in the field of optics, optoelectronics and bioimaging. Yet, their rational design is challenging because the photoluminescence properties, which strongly depend on molecular conformation and non-covalent interactions (NCI) in the solid state, are hardly predictable. In various cases, although a molecule exhibits strong photoluminescence in a solution, upon aggregation, the effect is quenched (aggregation-caused-quenching), whereas in other cases modes of aggregation actually enhance the luminescent properties (aggregation-induced-emission). An avenue to reduce the quenching lies either in intramolecular modification of a fluorophore or by controlling the formation of weak non-covalent intermolecular interactions in a crystalline phase. An alternative way to efficiently alter the response of solid-state luminescent material is to expose it to external high pressure and alter structural features upon compression.

Here we present chemical [1] and mechanical functionalization [2] of anthracene-based crystalline materials (Figure 1), that proved to be fluorescent upon compression. Our structural studies are supported by spectroscopic measurements and quantum crystallography tools to better describe structure-property correlation and explain the mechanism of solid-state emission enhancement.

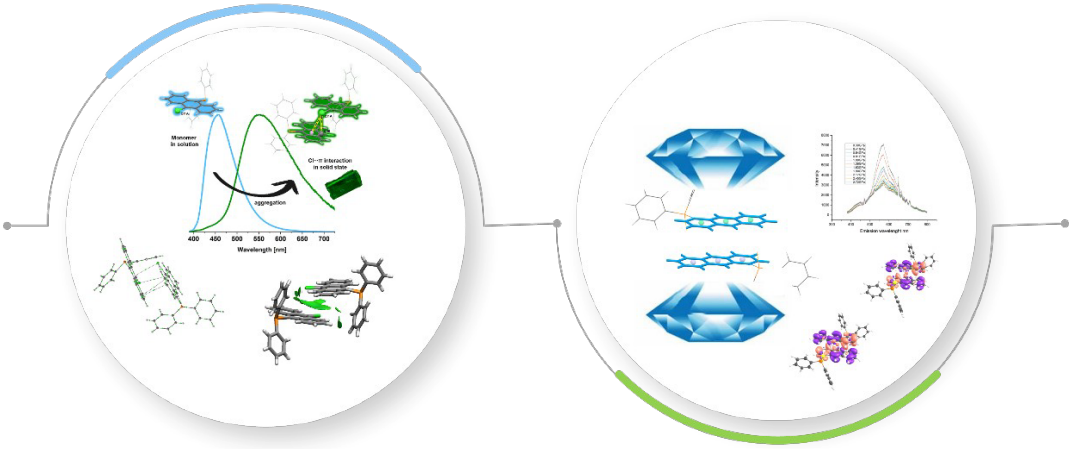

Figure 1. Functionalization of anthracene-based solid-state materials.

[1] Patten, T., Graw, N., Friedl, S., Stalke, D.& Krawczuk, A. (2023) *Adv. Opt. Mat.*, **11**, 2202753.

[2] Krawczuk, A., Sidat, M. A., Crespo-Otero R. A., Olejniczak, A., Wozny, P., & Katrusiak, A. (2024), in preparation.