

## Time-resolved microphotoluminescence study of 2D layered hybrid perovskites crystals. Correlation between the structural and optical properties.

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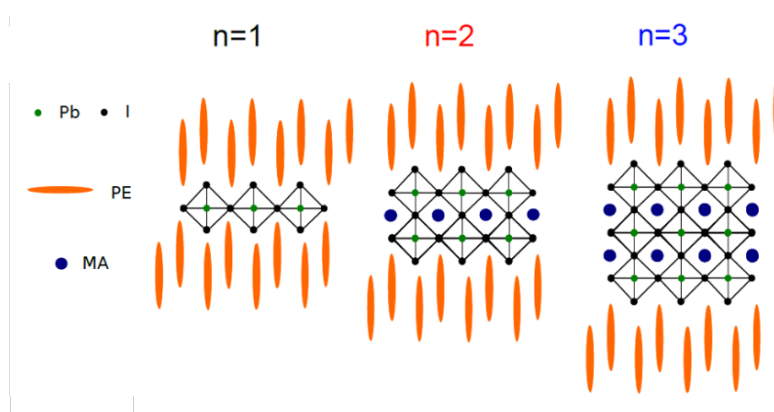
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Over the past few years, organic-inorganic halide 3D perovskites (3D-HOP) were found to present remarkable optoelectronic properties. In particular, the efficiency of perovskite solar cells rivals now with commercial silicon solar cells. However, their instability in presence of moisture and under irradiation hinders their practical applications.

There is currently a renewed interest in 2D layered hybrid perovskites (2D-HOP) due to their chemical versatility and stability. They consist in natural self-assembled quantum well where the perovskite layers are separated by bulky organic cations. Recently, solar cells based on low-dimensional perovskites have demonstrated high efficiency and improved stability. [1] However, the fundamental photophysics of 2D-HOP is not fully understood. A great attention has been paid to thin films, which present generally multiple phases and grain boundaries, as an ideal building block for PV and LED devices. Nevertheless, the study of crystals has proven necessary to unveil some of the intrinsic properties of hybrid perovskites. [2,3]



**Fig.1** Schematic representation of  $(C_6H_5C_2H_4NH_3)_2(CH_3NH_3)_{n-1}Pb_nI_{3n+1}$  ( $n=1,2$  and  $3$ ) structures

In this work, we have studied the optical properties of 2D layered perovskites crystals of  $(C_6H_5C_2H_4NH_3)_2(CH_3NH_3)_{n-1}Pb_nI_{3n+1}$  ( $n=1,2$  and  $3$ ) (Fig. 1) using time-resolved microphotoluminescence as function of temperature. The emission properties are correlated with the material morphology. Analysis of the fluence and temperature dependence of the photoluminescence decay provides insight into the exciton recombination dynamics in low-dimensional perovskites.

- 1) H. Tsai, et al., Nature 536, 312 (2016).
- 2) H. Diab et al., J. Phys. Chem. Lett. 7, 5093 (2016).
- 3) J. C. Blancon, et al., Science 355, 1288 (2017).

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