

Micro-photoluminescence study of 2D-layered hybrid perovskite monocrystalline thin films. Correlation between the structural and optoelectronics properties.

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Over the past few years, organic-inorganic halide 3D perovskites (3D-HOP) were found to present remarkable optoelectronic properties. A great attention has been paid to perovskites thin films, as an ideal building block for PV and LED devices. On the other hand, the study of single crystals has proven necessary to unveil some of the intrinsic properties of these semiconductors [1,2].

While the 2D perovskites have been known for decades, they are attracting growing interest, for their strong PL properties, their chemical versatility and their low sensitivity to external degradation mechanisms due to UV light and moisture.

Monocrystalline thin films of phenylethylammonium-based 2D perovskites ($(C_6H_5C_2H_4NH_3)_2PbI_4$ and their 2D/3D derivatives are produced using the “Anti-solvent Vapor Assisted Capping Crystallization [3]. A cryogenic micro-photoluminescence study of these samples will be presented (with a sub micrometer precision), allowing to extract the intrinsic properties of the perovskite crystals, such as electron-phonon coupling and the PL lifetimes. This technique allows in particular to finely correlate the optoelectronic properties of the produced films with their morphology.

The optoelectronic properties of these monocrystalline thin films will be compared to the ones of spin-coated polycrystalline perovskites films. They will be also compared to the ones published on butylammonium-based 2D perovskites, that were recently used to create efficient and longed-lived solar cells [4].

References:

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