

Micro-photoluminescence study of 2D-layered perovskites crystals and 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, there is growing interest in their structure, for their strong PL properties, their chemical versatility and their low sensitivity to external degradation mechanisms (due to UV light, water,...) .

In this poster, we will study the optical properties of phenylethylammonium based 2D perovskites $(C_6H_5C_2H_4NH_3)_2PbI_4$ and their 2d/3d derivatives. A cryogenic micro-photoluminescence study will be presented (with a sub micrometer precision). This technique allows to finely correlate the optoelectronic properties (excitons/phonons, ...) of the produced films with their morphology. These properties are then compared to the ones of spin coated polycrystalline perovskites films. This study allows to extract the intrinsic properties of the perovskites crystals (electron phonon/ coupling, PL lifetimes). Finally, we will also compare our results to the one published on butylammonium based 2D perovskites, that were recently used to create efficient and longed-lived solar cells [3], despite their large binding energies.

[1] Shi, Dong, et al. *Science* 347.6221 (2015): 519-522.

[2] H. Diab, G. Trippé-Allard, F. Lédée, K. Jemli, C. Vilar et al., *J. Phys. Chem. Lett.* 10.1021/acs.jpcllett.6b02261

[3] Tsai, Hsinhan, et al. *Nature* 536.7616 (2016): 312-316.

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