

Micro-photoluminescence study of halide perovskites monocrystalline films. Correlation between the structural and optoelectronics properties.

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Over the past few years, organic inorganic halide perovskites were shown 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. Despite many improvements, these thin films still possess a poly-crystalline structure, with micrometer grains [1] and defects, that limit the efficiency of the devices.

To avoid these structural issues, many efforts are dedicated to grow monocrystalline thin films. This poster will present an innovative growth technique that allows a simple and very fast growth of such perovskites films with good monocrystalline properties [3]. This method is based on a "Anti solvent Vapor assisted Capping Crystallization" (AVCC). It has been easily adapted to various kind of perovskites: 2D ($C_6H_5C_2H_4NH_3$)₂PbI₄, 3D (CH₃NH₃PbBr₃), or 2D/3D mixes.

In a second part of this poster, 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 one of spin coated polycrystalline perovskites films. This comparison is useful to extract the intrinsic properties of the perovskites crystals.

[1] G. Grancini, A.R. Srimath Kandada, J.M. Frost, A.J. Barker, M. De Bastiani et al., Nature Photonics (2015), 7 (10), 695-702.

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

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