VAPOR DEPOSITION OF ORGANIC-INORGANIC THIN FILMS FOR ENERGY APPLICATIONS

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Physical vapor deposition (PVD) is an efficient method of thin-film deposition with a variety of advantages over solution processing: the absence of solvents allows depositing easily two or more materials; multilayers can be deposited on the top of each other; layer thickness can be controlled with nanometer precision; absence of solvents and vacuum processing reduces impurities [1-4].

Thin-film deposition using a customized physical vapor methodology has been described for organic and inorganic materials with wide use in molecular electronics such as organic semiconductors [3], lead halide perovskites [1,4], and ionic liquids [2].

The PVD procedure is optimized based on the volatility of the deposition sources, from the mass flow of effusing vapor from Knudsen cells maintained at phase equilibrium conditions. This procedure of vapor deposition presents a high versatility to the fabrication of high purity thin films, multilayers, and hybrid materials.

The formation of high-quality, homogeneous and compact thin films has been achieved for organic semiconductor materials and hybrid organic-inorganic perovskites (e.g. Fig.1). Moreover, the nanoconfinement of ionic liquids into semiconductor materials has been explored considering the nucleation and growth mechanisms of nanodroplets and thin films of ionic liquids.

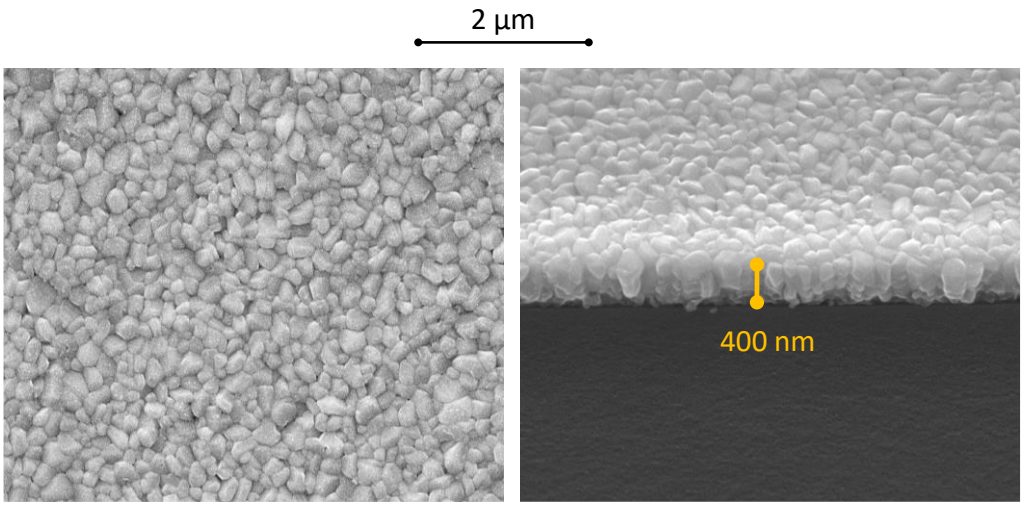

Fig.1. SEM images of hybrid organic-inorganic perovskite thin films ($MAPbI_3$) fabricated by dual-source PVD on ITO coated glass. Top and cross-sectional views (50 000×).

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