Direct Metal to Halide Perovskite (HaP) Transformation an Alternative Route to HaP films

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We will present a simple process to convert a metallic film of $Pb^{(0)}$, $Sn^{(0)}$ or a mixture of those to an ABX_3 halide perovskite by introducing to AX [e.g.: A - methylammonium iodide (MA), formamidinium (FA) or Cs; X - I, Br] salts dissolved in simple alcoholic solvents.[1] The novel approach allows a high-quality continuous films of various (including mixed) halide perovskites, that can be easily up-scaled to large areas using a low toxicity process. The much diminished toxicity of this fabrication method is achieved by avoiding the use of commonly used polar aprotic solvents, such as dimethylformamide or dimethylsulfoxide, which become very toxic when containing Pb salts (such as PbX_2 or Pb-acetate).

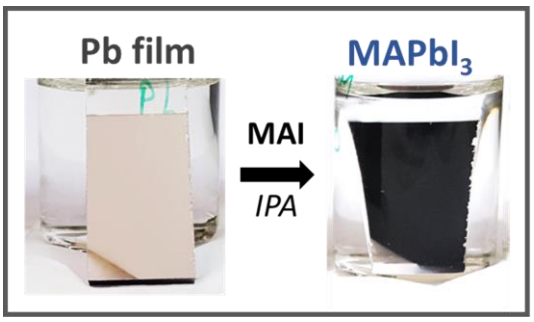

Figure: Pb film (~ 100 nm) evaporated on d-TiO_2 /FTO/glass substrate glass before and after treatment with MAI dissolved in IPA

We will describe of our findings, including examples of the direct transformation from Pb or Sn to, for example, $MAPbI_3$, $MAPbBr_3$, $MAPb(Br,I)_3$, $MASnI_3$ and the pseudo-perovskite Cs_2SnI_6. We will show the broad morphological tunability allowed by this process and present how *electrochemistry* can further assist in optimization of the process. Apart from I-V characterizations of full devices, morphological, optical and (opto-)electronic characterizations will be presented.

References

[1] Y. Rakita, N. Kedem, D. Cahen, G. Hodes, Pat.Appl. # IL 245536 2016-024 *'Process for the preparation of halide perovskites and perovskite-related materials'*