UNIMORE Dipartimento di Scienze Fisiche, Informatiche e Matematiche
UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

CNR NANO MODENA S3

FIM-S3 SEMINAR

Phase stability and defects dynamics in halide perovskites: fundamental processes affecting the efficiency and stability of hybrid perovskites for solar cells applications

Wednesday April 21st, 2021 – 16.00

Online streaming using Google Meet
Link: https://meet.google.com/yud-upbp-mno

Speaker

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Abstract

Hybrid organic-inorganic halide perovskites, compounds with an chemical ABX_3 stoichiometry, where A is an organic or inorganic monovalent cation ($A=Cs^+$, $CH_3NH_3^+$, $(CH_2)_2NH^+$), $B=Pb^{2+}$, Sn^{2+} and $X=I^-$, Br^-, attracted great attention in the last decade thanks to the efficiency that has quickly been reached in solar cells based on these systems. With a power conversion efficiency PCE > 25% (more than 1/4 of solar light hitting the film converted into electric power), perovskite solar cells approached and, in many cases, overcame the efficiency of solar cells based on traditional materials. Even more exciting is the fact that light harvesting films for perovskite solar cells can be fabricated using simple and cheap deposition techniques, such as simple spin-coating of precursors or even ink-jet printing, which make perovskite solar cells suitable for mass production.
However, access to the market is prevented by the relative instability of perovskites, which degrade under the action of stressing agents, such as humidity and even light itself. In addition, some of the most promising perovskites, e.g., $(CH_2)_2NHPbI_3$, are intrinsically unstable and transform in another, non-perovskite phase, the so-called d-phase, at operative conditions, preventing their use for photovoltaic applications. Moreover, though the preparation with cheap processes indicated that halide perovskites are little sensible to defects, a further increase of the efficiency requires a reconsideration of the effect of defects, to introduce approaches for a proper defects' management. This is important especially if one considers that defects have been identified as potentially responsible for some of the degradation processes taking place in organic-inorganic halide perovskites.

In this talk I will discuss our recent experimental and theoretical results about the origin of degradation of organic-inorganic halide perovskites, effect of defects on their properties and defects' dynamics.

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