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SEMINAIRE IPCMS
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Optoelectronic properties of 3D and layered halide perovskite semiconductors

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In the past five years, solution-processed organometallic perovskite based solar cells have emerged as a promising thin-film photovoltaic technology. The most promising results were initially obtained with 3D halide perovskites. Presently, the intended optoelectronic applications of this class of materials are in the realm of conventional semiconductors. Layered 2D Ruddlesden-Popper phases, composed of perovskite multilayers sandwiched between two layers of large organic cations, have recently demonstrated improved photostability under standard illumination as well as humidity resistance over 2000 hours, affording a conversion efficiency of 12.5 % for photovoltaics. In this case, intrinsic quantum and dielectric carrier confinements are afforded by the organic inner barriers, which lead to a stable Wannier exciton at room temperature. However, device efficiencies are essentially related to extremely efficient internal exciton dissociation through edge states in layered 2D Ruddlesden-Popper perovskites, as shown from the investigation of both thin films and small single crystals.

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