MMPS28 Halide perovskites for opto-electronic applications

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Résumé
Since their first applications in photovoltaics in 2009, hybrid halide perovskites attracted huge scientific and technological attention mainly due to the unprecedented improvement of the solar power conversion efficiencies (PCE) of their related devices. Today, solar cells based on perovskites have achieved PCE values of more than 25%, surpassing amorphous and polycrystalline silicon [1]. In addition, halide perovskites exhibit a unique set of semiconducting properties, such as large absorption coefficient, long carriers lifetime and diffusion, strong light emission, making these materials ideal for a wide range of applications like light emission devices, photo-detectors, photo-catalysts, lasers, spintronics and many others [2-5]. Taking into account their wide flexibility in terms of structure and dimensionality (e.g. layered perovskites, nanoparticles), and the fact that their fabrication processes remain compatible with low-cost production techniques, the technological application of halide perovskites for future opto-electronics devices remain undoubtful.

On the other hand, the successful exploitation of halide perovskites has also stimulated the adoption of an innovative multi-disciplinary approach, aimed towards understanding the behaviour of these materials at various scales, going from a) basic semiconducting properties, rationalised on the basis of a sound theory to computational design of novel materials [6] b) structure-properties relationships, investigated via the development of appropriate synthetic approach linked to accurate structural and spectroscopic characterisation techniques [7], c) device fabrication and optimisation, with particular attention to surfaces and interface optimisation and in the treatment of the inherent limited stability of hybrid halide perovskites [7,8].

This symposium aims to bring together the condensed mater community involved in the research of hybrid perovskites in France, which is one of the first historically committed to the field. This will create a multi-disciplinary scientific setting wide enough to cover physics, chemistry to materials science and engineering, and provide the means to discuss the most recent breakthroughs related to halide perovskites, the fundamental condensed matter science that relates to the technological application. To this aim, several topics will covered such as basic response and novel applications of dimensionally reduced (layered, nanoparticle, columnar etc.) halide perovskites; approaches to the development of lead-free and lead depleted compounds (synthesis and material discovery); concepts for materials with novel functionalities; materials characterisation at different length- and time-scales; current and future perspective of applications and technologic exploitation of halide perovskites.

Références :
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