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Preface: Special Topic on Perovskite Solar Cells

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Perovskites are an old class of materials, named after the mineralogist Lew A. Perowskite. They cover a broad range of ternary oxides, nitrides, halides, and even other compositions. The common thread between the different classes of perovskites is the AMX_3 stoichiometry. Recently, lead halide perovskites have garnered much attention in the photovoltaic community due to two publications, coming out in 2012,[1,2] reporting efficiencies around 10%. With the high potential of these materials, many researchers have started working in the field nearly doubling the efficiencies within the last two years. This amazing high efficiency combined with a material which can be solution or low temperature processed makes perovskite cells so extremely attractive. However, many aspects about the working mechanisms in the cell are not yet understood and we are at the beginning to develop some understanding how this exciting material can deliver such high functionality.

Currently, new papers are being published in this fast progressing field almost daily. Additionally, there are a number of review articles and commentaries on this hot topic. As far as we are aware, this is the first special issue on the topic. We are very happy that many researchers followed our call and published their latest results. This gives an excellent overview of the current status in the field of perovskite solar cells. The papers cover a wide range of aspects from chemistry over material science to physics, both experimentally and theoretically, mirroring the interdisciplinary nature of this research field.

In this issue several important aspects of perovskite solar cells are investigated: Processing conditions to give reproducible highly efficient devices, the role of morphology and crystallinity of the perovskite film, and specific contact layers for electron and hole collection, respectively, are covered. We also find some theoretical modelling looking at the electric field dependence of the ferroelectric structure, electronic structure calculation for alternative perovskites, and the mechanical stability of perovskites. Physical measurements are performed to analyse the persistent photovoltage and the charge carrier recombination channels.

This special issue gives an excellent snapshot of the current research in this exciting field, a snapshot of the important issues to be resolved and understood, and helps to guide further research activities. It is expected that progress in the field will further accelerate with more researchers focusing on this topic. APL Materials has published exciting perovskite solar research before and is happy to be able to offer this special issue on forefront cutting-edge science, which is another example where the material is the key issue for significant progress.

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[2] M. M. Lee, J. Teuscher, T. Miyasaka, T. N. Murakami, and H. J. Snaith, "Efficient hybrid solar cells based on meso-superstructured organometal halide perovskites," Science **338**, 643 (2012).

