**Solution-Processed Perovskite Optoelectronics**

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Lead halide perovskites have seen a stellar rise as an emerging class of solution and vacuum processable materials with exceptional optoelectronic properties. Lead halide perovskite solar cells (PSCs) with certified efficiencies of 25.2% have been reported recently, leaving only a marginal gap of 1.5% to the most efficient (non-concentrator) silicon solar cell ever reported. We will summarise the stage of development in the field and report on some of the recent progress accomplished in our group. Back-contact concepts have previously been used to make some of the world’s most efficient silicon solar cells. Here we describe the challenges of applying this concept to PSCs. We discuss a number of different back-contact architectures and present strategies for fabricating these with mask free processes and resolutions down to the sub-micron level. The second part of this talk will focus on the growth and application of single-crystalline lead halide platelets firstly for the fabrication of electro-optical modulators and secondly the study of light-induced halide-demixing. We will conclude with an outlook on lead-free stable perovskite-inspired absorbers and our recent progress in developing sulphur-doped silver bismuth iodides solar cells with > 5.4% efficiency.