**Link:** <https://solar-power-tech.com/e-posters/psc_eposter_17/>

**Abstract**

Solar cells based on hybrid organic/inorganic perovskites show an astonishing efficiency development in the past years, having peaked in power conversion efficiencies of 25.6% for a small area single junction device[1]. While perovskite thin films can be deposited by physical vapor deposition techniques and hybrid routes, processing from a solution of precursor salts is currently most frequently employed in the fabrication of perovskite photovoltaic devices with highest efficiencies. Active areas of record solar cells, however, are usually very small and in the mm² range. To pave the way for future commercialization, high power conversion efficiencies need to be demonstrated also on areas multiple orders of magnitude larger. Since perovskites containing the methylammonium (MA) cation are suspected to result in inferior device stability[2], one focus of research is now on MA-free perovskites in which the A-site is occupied by e.g. formamidinium (FA), caesium (Cs) or a mixture thereof. Most of the results for device upscaling presented in literature, however, are still based on methylammonium lead iodide (MAPbI3).

In this work, we present perovskite photovoltaic modules with FACs based absorber layers. All materials processable from solution (hole and electron transport layers as well as the perovskite absorber layer) were deposited by blade coating, demonstrating the feasibility of this approach for large area module fabrication. In order to deposit homogeneous layers, the coating process was analyzed in detail and a model based on the Landau-Levich problem was developed for the blade coating setup. The perovskite crystallinity could be improved by the addition of Lead(II) thiocyanate (Pb(SCN)2), which resulted in increased crystallite size as judged by Williamson-Hall analysis of X-Ray diffraction data and corresponding scanning electron microscopy images. The homogeneity of the final modules was investigated with dark lock-in thermography and electroluminescence imaging, indicating only few shunts in the module area. Modules were made up of 15 serially interconnected solar cells and revealed a stabilized power conversion efficiency of 12.6 % on an active area of 66 cm². In the presentation, further pathways to increase the performance of these devices will be discussed.