The Crucial Role of Interfaces in Hybrid Photovoltaic Devices

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Perovskite solar cells demonstrate an enormous potential for next generation photovoltaics because of their ease and low cost of fabrication in combination with their excellent light-harvesting properties. These devices usually consist of ca. 300-500 nm thick layer of an organometallic halide perovskite, sandwiched between two charge-transporting layers. Here, we present the results of a detailed study on the nature and energetics of organic charge-transporting materials with regard to the photovoltaic performance of the hybrid device. We show that the energetics at the interface between the perovskite and the transport layer affects the device performance through the rate of interfacial charge recombination. We also highlight the role of the charge transport material in determining the speed of charge extraction and with that the fill factor of the device. Solar cells with well-selected organic layers exhibit power conversion efficiencies of 20 % and above, with the prospect for further improvements through the optimization of the organic layer structure.