P38

Effect of Charge Transport Layers on Charge Extraction Kinetics in Perovskite Solar Cells Investigated by Kinetic Photoconductivity.

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Perovskite solar cells (PSCs) are among the most rapidly developing photovoltaic technologies, with power conversion efficiencies increasing from 3.8% to 27.2% in less than two decades [1–3]. Further improvements require a better understanding of charge extraction and transport processes, particularly at interfaces with charge transport layers.

In this work, the effect of different charge transport layers (CTLs) on charge extraction kinetics in perovskite solar cells was investigated using the kinetic photoconductivity method. The measurements revealed pronounced differences in charge extraction kinetics depending on the materials employed as charge transport layers. Comparison of novel CTLs with established high-performing materials, such as SnO_2 and MeO-2PACz, provided insight into charge extraction efficiency, interfacial energetics, and band bending within the investigated semiconductor systems.

Based on the obtained kinetic data, schematic band-bending profiles were constructed for the investigated CTLs. These profiles enabled a comparative assessment of their charge extraction properties and their suitability as charge transport layers in perovskite solar cells.

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