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BOOK OF ABSTRACTS

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METAL-OXIDE-SEMICONDUCTOR DEVICES FOR INTERFACE STUDIES FOR PEROVSKITE TECHNOLOGY

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Abstract

Perovskite solar cells (PSCs) are one of the most promising technologies within the field of photovoltaics. Among several challenges, developing and optimizing efficient electron transport layers (ETLs) that can be up scaled, remains a massive task. Admittance measurements on Metal-Oxide-Semiconductor (MOS) devices can be used to better understand the optoelectronic properties in perovskite solar cells, specifically the interfaces between the perovskite and a charge carrier transport layer. This work discloses a new pathway for a fundamental characterization of the oxide/semiconductor interface for PSCs

devices. Inverted MOS structures, *i.e.* glass/fluorine-doped tin oxide (FTO)/tin oxide (SnO_2)/perovskite/gold were fabricated and measured allowing to perform a comparative study on the optoelectronic characteristics of the interface between the perovskite and a sputtered SnO_2 , which is used as an electron charge carrier extraction, also named ETL. The measurements allowed us to assess the influence of the SnO_2 thickness and annealing conditions on the SnO_2 /perovskite interface optoelectronic properties. Interface fixed oxide charges (Q_f) and interface traps density (D_{it}) were estimated from capacitance-voltage-frequency (C-V-f) and capacitance-conductance-frequency (C-G-f) measurements. It was concluded that a 30 nm thick SnO_2 layer without annealing presented an additional recombination mechanism compared to a 20 nm thick SnO_2 layer on a MOS device. The MOS device with a 20 nm thick SnO_2 layer without annealing presented the highest positive Q_f values. Thus, it was shown an effective method for the characterization of the charge carrier transport layer/perovskite interface, recurring to the analysis of admittance measurements performed on perovskite-based inverted MOS devices.

Keywords

Metal-Oxide-Semiconductor (MOS); Perovskite; Traps; Interface; Electrical measurements.

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