

Interfacial engineering of self-assembled monolayer modified semi-roll-to-roll planar heterojunction perovskite solar cells on flexible substrates - DTU Orbit (08/11/2017)

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The morphologies of the perovskite (e.g. CH₃NH₃PbI₃) layer are demonstrated to be critically important for highly efficient perovskite solar cells. This work applies 3-aminopropanoic acid as a self-assembled monolayer (C3-SAM) on a poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) hole transport layer (HTL) to modify the crystallinity and coverage of the CH₃NH₃PbI₃ Cl-x(x) film, resulting in a much smoother perovskite surface morphology together with a PCE increase from 9.7% to 11.6%. Since all fabrication steps of these inverted structure devices are carried out under low temperature conditions (processing temperature <120 degrees C), it is possible to employ this method on flexible polymer substrates using roll-coating for the layer deposition. The roll-coated perovskite film on C3-SAM modified PEDOT:PSS presents a similar trend of improvement and results in enhanced PCE from 3.7% to 5.1%. The successful application of the facile HTL modification indicates a common strategy for SAM material design and selection for efficiency enhancement in perovskite photovoltaic devices.

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Authors: Gu, Z. (Ekstern), Zuo, L. (Ekstern), Larsen-Olsen, T. T. (Intern), Ye, T. (Ekstern), Wu, G. (Ekstern), Krebs, F. C. (Intern), Chen, H. (Ekstern)

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