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The role of graphene-doped PEDOT:PSS as hole transporting layer in inverted perovskite solar cells

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Abstract

The undesirable reactions from poly(3,4-ethylenedioxythiophene):poly (styrene sulfonate) (PEDOT:PSS), which presents hygroscopic and acid character of PSS- group, reduces drastically the stability and efficiency of inverted perovskite solar cells. We developed a facile synthesis method of graphene platelets into PEDOT:PSS solution in order to block these unstable reactions. The homogenous graphene-doped PEDOT:PSS layer show up to 10 times improvements on its conductivity, maintaining high optical transmittance. Additionally, the standard CH3NH3PbI3 film grown on graphene-doped PEDOT:PSS layer exhibits large perovskite crystallite size and a reduction of PbI2 content, leading high stability over time. The hydrophobic character of graphene probably blocks undesirable reactions hampering degradation. The inverted perovskite solar cells based on graphene-doped PEDOT:PSS as hole transport layer show better photovoltaic parameters by increasing charge extraction analyzed by impedance spectroscopy. This simple and low-cost preparation method leads to a successful candidate to synthetize effective hole transport layer to be considered in optoelectronic devices.

Biography

Teresa S. Ripolles finished her PhD in Prof. Bisquert's Group at UJI in organic photovoltaic solar cells on 2014, with Ph.D, Extraordinary award. she has spent 4 years as assistant professor at kyushu institute of technology in japan. In 2015, she got a grant-in-aid for scientific research as a principal investigator for young scientist for 2 years and a budget of 27.550 €. Her research interest perovskite solar energy conversion, bonding of nano particles to electrode surfaces, fabrication of solar cells and their characterization by techniques like impedance spectroscopy, transient absorption spectroscopy, X-Ray diffraction, UPS, XPS, AFM, SEM, external quantum efficiency and UV-visible spectroscopy. To date, she has worked in various research groups in different universities and companies, including Bayer technology services (Germany, 2010), prof. diau's group at the national chiao tung university and víctor batista at the yale university. Furthermore, she has attended several congresses and conferences around the world. In particular, she was awarded Best poster in nanostructured hybrid materials for energy conversion and storage summer School (Italy, 2011) and she was invited as a speaker in MRS Fall Meeting & exhibit (Boston, 2016).

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