Customised photo-rig for the simultaneous measurement of multiple photobleaching photovoltaic materials

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Abstract

The stability of solution processed organic and perovskite photovoltaics (PV) is now widely recognised as a critical challenge toward their commercialisation, with device degradation under light and oxygen of key consideration. Photobleaching is a commonly used technique for screening materials for their photochemical stability. Here we demonstrate a novel approach for the fast initial screening of the photochemical stability of PV materials using a customised photo-rig. The films under test are degraded under different lighting conditions under dry air conditions and the photobleaching process of the samples is monitored by a program-controlled high-resolution camera. Photobleaching rates are calculated by analysing the RGB elements as a function of time. Our preliminary results of the photochemical stability studies show that Poly({4,8-bis[(2-ethylhexyl)oxy]benzo[1,2-b:4,5-b]dithiophene-2,6-diyl}{3-fluoro-2-[(2-ethylhexyl)carbonyl]thieno[3,4-b]thiophenediyl}) (PBT7) and poly-(3-(2-methylhexyloxycarbonyl)dithiophene) (P3MHOCT) are the least stable among the nine organic PV polymers studied. In comparison to other optical spectroscopy studies such as UV-Vis spectroscopy, this technique is advantageous as an easy method for the fast initial screening of the photochemical stability of multiple PV materials simultaneously.

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