High stability of benzotriazole and benzodithiophene containing medium band-gap polymer solar cell - DTU Orbit (04/10/2019)

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The improvement of polymer solar cell stability is a challenge for the scientists and has significant implications commercially. In this study, we investigated the stability of a novel P-SBTBDT active material applied in an inverted type solar cell. Detailed stability experiments comprising shelf life, laboratory weathering and outdoor testing were carried out according to ISOS testing guidelines. Shelf life showed that P-SBTBDT solar cells were very stable after 840 h with encapsulation. Although accelerated weathering aging tests are very harsh, the devices remained stable after the burn-in phase with T50 from 700 to 840 h, with some P-SBTBDT solar cells did not reach T50 in the time span of the test. Degradation tests on the P-SBTBDT solar cells which were carried out under natural solar light indicated that T40 was reached after 840 h. The results of dark, light, damp and dry stability tests showed that most of the degradation was provoked by failure of the encapsulation. The experiments indicated that P-SBTBDT solar cells are sensitive to light and oxygen but are strikingly stable under humid conditions. Further developments for minimizing the degradation effects using UV-filters and better encapsulation are some of the necessary improvements in further research.

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