Lifetime of organic photovoltaics - DTU Orbit (08/11/2017)

Lifetime of organic photovoltaics: Linking outdoor and indoor tests

A comprehensive outdoor study of polymer solar cells and modules for duration of one year was conducted. Different sample geometries and encapsulations were employed in order to study the spread in the lifetimes. The study is a complimentary report to previous work that focused on indoor ageing tests. Comparison of the indoor and outdoor lifetimes was performed by means of the o-diagram, which constitutes the initial steps towards establishing a method for predicting the lifetime of an organic photovoltaic device under real operational conditions based on a selection of accelerated indoor tests. Acceleration factors were determined using the ISOS-protocols, which enabled reproducible data acquisition between different laboratories and operators within the OPV community. A semi-automatic filtering method was employed for processing data acquired in outdoor tests. It was found that the lifetime of the samples tested under outdoor conditions was somewhere between the lifetimes of samples measured in accelerated indoor test conditions of damp heat and light soaking (ISOS-D-3 and ISOS-L-2) and in moderate indoor test conditions (shelf life and high temperature storage). The presented results reveal that while the accelerated ageing studies reveal days and weeks of lifetime for the studied samples, in outdoor real operational conditions the samples demonstrate stability up to months and seasons.

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