

Effects of concentrated sunlight on efficiency and stability of fullerene-polymer solar cells

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After reviewing state-of-the-art in two seemingly discontinuous areas of photovoltaic (PV) research - PV conversion of concentrated sunlight and organic photovoltaics (OPV) based conjugated polymer / fullerene bulk hetero-junction solar cells - we address the following questions:

(1) can organic cells be part of the concentrator PV?

(2) can concentrated sunlight be useful for investigation of OPV cells and, in particular, for accelerated studies of light induced mechanisms in the OPV degradation?

Answering to the first question, we suggest that in addition to power generation at 1 sun ($1 \text{ sun} = 100 \text{ mW/cm}^2$), stable OPV device can also be used for power generation with low-cost stationary concentrators of sunlight working in the low concentration regime ($1 \text{ sun} < C < 10 \text{ suns}$). To check this hypothesis the effects of sunlight concentration on the PV performance and stability of OPV devices were investigated. In particular, we report our experimental results [1] for the exploitation of concentrated sunlight for such a study using an outdoor/indoor test facility [2-3] based on the fiber-optic/mini-dish concentrator.

Addressing the second question, we demonstrate that our experimental approach can be used for accelerated tests of light induced degradation mechanisms in the OPV devices [1, 4] and materials [5].

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