

Diploma thesis abstract

«Spectral technique for organic solar cell efficiency measurement»

Gavrik Alexey Yurievich

Progress in organic photovoltaics manifests itself through rapid growth of the laboratory-made cell efficiency. It requires a laboratory technique to measure the energy conversion efficiency precise and accurate. Use of a common technique based on use of a silicon reference cell can lead to large errors for organic solar cell due to significant differences (e.g., spectral) between silicon reference and the organic test cell.

In this work, a spectral technique for measurement of the organic solar cell efficiency is presented. The spectral technique is tested on polymer, hybrid (organic-inorganic) and dye-sensitized solar cells.

Within the framework of this work, wide used technique based on comparison between reference and test cell is analysed, and its disadvantages are discussed. The presented spectral technique is based on the calibrated spectrometer instead of a silicon photodetector. The spectral technique allows efficiency determination for different types of solar cells, independent from their response spectrum. The spectral technique presumes solar simulator spectrum and test cell external quantum efficiency measurement. A setup required for technique implementation was developed and constructed.

Several test cells are studied according to the spectral technique: polymer-fullerene cells made of different polymer types, hybrid cells based on zinc oxide and zinc phthalocyanine and dye-sensitized solar cells. Studied cells have large differences in spectral properties and efficiencies showing wide applicability of the spectral technique. For comparison, efficiency calculations according to the common technique are conducted showing differences between the common and the spectral techniques up to 12%. The spectral technique allows the estimation of measurement error. In this work, the measurement error for polymer cell efficiency was less than 4%.

Scientific adviser

PhD Vladimir Vasilievich Bruevich