ANNOTATION

In this work, organic solar cells based on star-shaped oligomers N(Ph-nT-DCV-R)$_3$ were studied. Such molecules are able to form a columnar phase in solar cell active layer, and this increases heterojunction ordering. Also these molecules contain both donor and acceptor parts, this leads to a decrease of the band gap and greater overlap with the solar radiation spectrum. As a result, the efficiency of solar cells can be increased.

In this work, the drift mobility of holes in ordered columnar and amorphous films of the N(Ph-3T-DCV-Hex)$_3$ was measured by space charge limited current method. It turned out that the hole mobility $4{,}8 \cdot 10^{-4}$ cm^2/(V·s) in columnar film exceeds the hole mobility $5{,}8 \cdot 10^{-5}$ cm^2/(V·s) in amorphous film by an order of magnitude.

Also in this work the dependence of photoelectric characteristics of solar cells on the molecular structure of donor component of active layer and the solar cell fabrication method was studied. It is determined that star-shaped oligomers with phenyl end groups and two or three thiophenes between the triphenylamine nucleus and the dicyanovinyl end groups are the most promising oligomers. The most suitable method for optimizing the morphology of active layer of solar cells based on N(Ph-2T-DCV-Ph)$_3$ was found: when a hot solution is applied to a hot substrate and the resulting film is annealed in solvent vapors, the short-circuit current of solar cell increases, and this increases the efficiency from 3.5% to 4.3%.

The obtained results indicate the prospects of further studies of organic solar cells based on star-shaped oligomers to improve their efficiency.