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**Abstract of PhD thesis**

**The effect of poly(3-hexylthiophene-2,5-diyl (P3HT) aggregation on the efficiency of solar cells using P3HT/fullerene derivative as active layer**

The aim of the doctoral thesis was to study the aging process of a mixture of poly (3-hexylthiophene-2,5-diyl) (P3HT) and methyl ester [6,6']-phenyl-C60 butyric acid (C60-PCBM) on the parameters values of photovoltaic cells.

Solar cells were produced by pouring a layer of solution onto a rotating substrate from three different solvents: toluene, chloroform and 1,2-dichlorobenzene. The solutions were subjected to a controlled aging process, and then the effect of this process on the efficiency of photovoltaic cells was examined. The aging process of P3HT:C60-PCBM solutions was carried out in two ways: aging of the P3HT:C60-PCBM mixture and aging of separate solutions of P3HT and C60-PCBM. The research has also been extended by comparing the influence of the formation time of the P3HT:C60-PCBM layer on the efficiency of solar cells, through the application of fast and slow solidification of layers.

Measured and experimentally determined values of electrical parameters of photovoltaic cells obtained from fresh and aged solutions were correlated with the morphology of active layers, by means of: atomic force microscopy (AFM), UV-Vis spectroscopy, as well as X-ray diffraction (XRD).

The carried out research shows, that the method of conducting the aging process and the type of solvent have a significant impact on the parameters of photovoltaic cells, which is directly related to the morphology of the volume volumetric joint and its changes. In these research optimized also the conditions for the production of photovoltaic cells. Selected solar cells were characterized by the stability of devices and their average efficiency exceeded 4%.

The doctoral dissertation includes a discussion of the results in the context of broader issues related to the impact of the P3HT polymer aggregation process on solar cell efficiency, as well as the practical applications of research results in photovoltaic cell technology.

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