The Influence of area of organic solar cell on its characteristics

Annotation

It is known that when area of organic solar cell increases the cell efficiency decreases significantly. This fact limits the possibility of the organic solar cell usage in the solar energy. One of the reasons of the efficiency decrease is a relatively large value of surface resistance of a transparent electrode conducting organic solar cell current as well as inhomogeneity of the organic solar cell active layer. This thesis provides results of the experimental research how increase of organic solar cell area effects organic solar cell efficiency. There were developed and assembled a plant for production of thin films from a solution by the method of sliding meniscus which enables to produce the film with area up to some tens of sq. cm at speed 0.4 to 4.1 mm/s as well as an original computer program to control the plant. For composition P3HT-PCBM, there were determined optimal parameters of spreader cylinder acceleration and deceleration equal to 4.1 mm/s^2 as well as optimal volume of spread substance drop equal to 20–25 μl that is score of times less than for the standard laboratory centrifuge method. There were developed a technique of manufacturing of a polymeric transparent electrode with area up to some sq. cm and surface resistance in the range 30 to 100 Ω/sq., its relative error from a specimen to a specimen was less than 5%. With the help of the sliding meniscus there were obtained experimental specimens of polymeric solar cells on the base of P3HT-PCBM with efficiency ratio of 2% with a transparent electrode (anode). The results of comparison of the experimental and theoretical values of the electrical characteristics of specimens with different areas give the right to suppose that there are no other mechanisms of electrical characteristic degradation, except ohmic loss, of the polymeric solar cell when its area increases.