PREPARATION OF SNO_2/RGO PHOTOANODE FOR DYE-SENSITIZED SOLAR CELLS

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Photovoltaic batteries, including the III generation ones such as dye-sensitized solar cells (DSSC) permit generation of pure electric energy without releasing environmentally harmful chemical compounds to the atmosphere as it takes place when using fossil fuels for energy production. Unfortunately, the performance of such batteries is unsatisfactory and at present many research centers all over the world work on method for improvement of their efficiency [1-4]. An attractive compound for application in batteries is tin dioxide (SnO_2) which shows high electric conductivity, high light transparency, high chemical stability and mechanical strength. Thin films made of SnO_2 are characterized by high thermal stability up to 800°C in the air and in neutral atmospheres. These features make it a very attractive material for anodes in DSSC batteries. Hitherto in DSSC batteries the counter-electrodes were made of platinum because of its high electrocatalytic activity, high electric conductivity and high chemical stability. However, platinum is expensive and its limited resources do not permit planning its use on a wide scale. Hence the necessity to design and develop alternative electrode materials for DSSC. Attempts have been made to use metal oxides such as TiO_2, ZnO, SnO_2, used as photoanode materials, admixtured with carbon materials as alternative anodes in DSSC [5-8].

The aim of the study undertaken was to obtain and thoroughly characterize (physiochemically and electrochemically) the hybrid electrode materials based on tin dioxide and reduced graphene oxide (SnO_2/RGO) and test them as advanced electrodes in ecological batteries such as DSSC. A detail methodology of producing the technologically advanced hybrid materials for electrodes on the laboratory scale was proposed. According to this technology, tin (IV) oxide was synthesized using organic precursor of very low toxicity and high efficiency. Graphene oxide was produced by a modified Hummers method.

The final product was characterized by high purity and was subjected to reduction to get the form applicable in photovoltaic cells.

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