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Influence of dye adsorption temperature and time on the performance of dye sensitized solar cells

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One of the most critical steps of the dye sensitized solar cells (DSSC) manufacture is the dye adsorption, which directly affects the efficiency of the device, once the dye absorbs the sun light initiating the transfer process. The immersion of the semiconductor oxide on a dye solution is one of the ways to carry out the adsorption. Several parameters can influence the efficiency of this adsorption method. The aim of this work was the study of influence of the time between the preparation of the photoanode and dye adsorption and also the temperature of the photoanode before the immersion. The ZnO nanostructures were grown on a conductive glass substrate (SnO:F) using the Successive Ionic Layer Adsorption and Reaction (SILAR) and Chemical Bath Deposition (CBD) methods with subsequent immersion in 0,5 mM N719 ethanolic dye solution for 12 h. The dye adsorption was evaluated immediately after the preparation of the nanostructures and also after several days (7-33). For comparison, some of the prepared photoanodes were kept in oven at 90 °C. In order to evaluate the temperature effect, the nanostructures were immersed in the dye at room temperature (~23 °C) and at 80 °C. After 12 h immersion, DSSCs were prepared using these photoanodes and the photovoltaic performance was investigated by current-voltage measurement. The best result has been obtained with the cell that was prepared using the immediately prepared photoanode at 80 °C, reaching an efficiency of 0.1947 %.