Comparison of dye-sensitized solar cells built with TiO_2 and ZnO nanoparticles layer

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Abstract Dye-sensitized solar cells (DSSC) belong to the new generation of photo-electronic devices. Up to date their best efficiency exceeds 12 %. Their main advantages over the silicon counterparts (so far most common commercially) are much cheaper production costs and better efficiency in the conditions of intermediate or low illumination (inside the buildings or in the Polish climate zone). The working principle of DSSC is the interaction between the dyes with semiconductor metal oxide nanoparticles to which the dyes are attached. The nanoparticles covering one of the photocell's electrodes form a mesoporous structure with a very large specific surface area.

In this work, the performance of DSSC built with organic dye D149, iodide-based liquid electrolyte and TiO_2 or ZnO nanoparticles will be studied. The complete solar cells will be characterized by a number of techniques: current-voltage measurements, steady state absorption, transient absorption (in the time range from nanoseconds to milliseconds), voltage decay after laser pulse excitation and electrochemical impedance spectroscopy. The morphology of the nanostructures will be visualized with the use of scanning electron microscopy. Besides, the comparison of the two different metal oxide materials, and the effect of different dye loading on TiO_2 samples will also be investigated.

Acknowledgements

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Figures

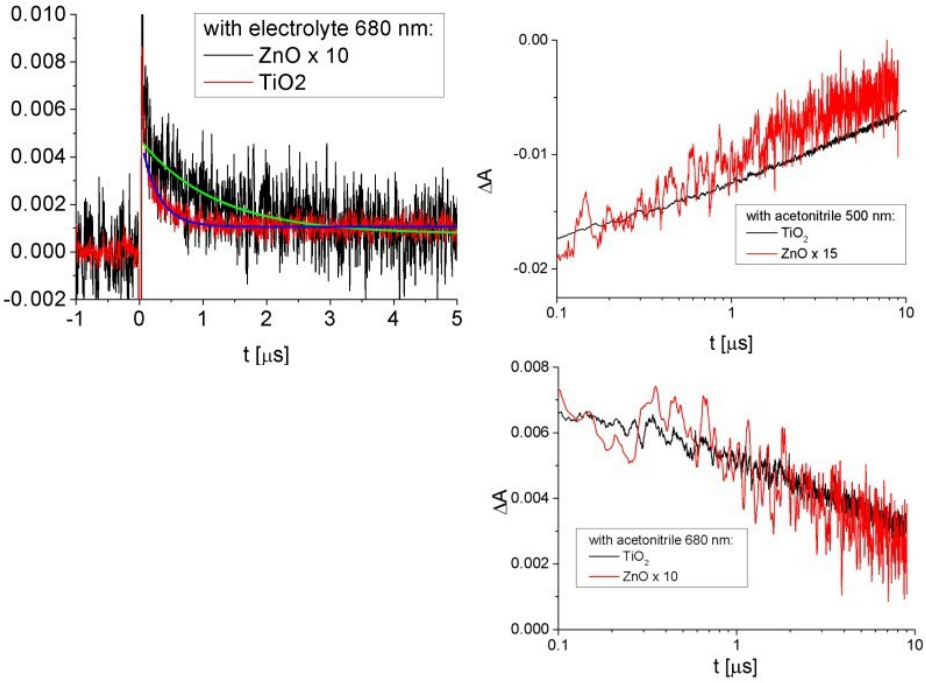

Fig. 1 Transient absorption curves for cells with electrolyte (top left) and acetonitrile (top right and bottom) using indicated wavelengths.

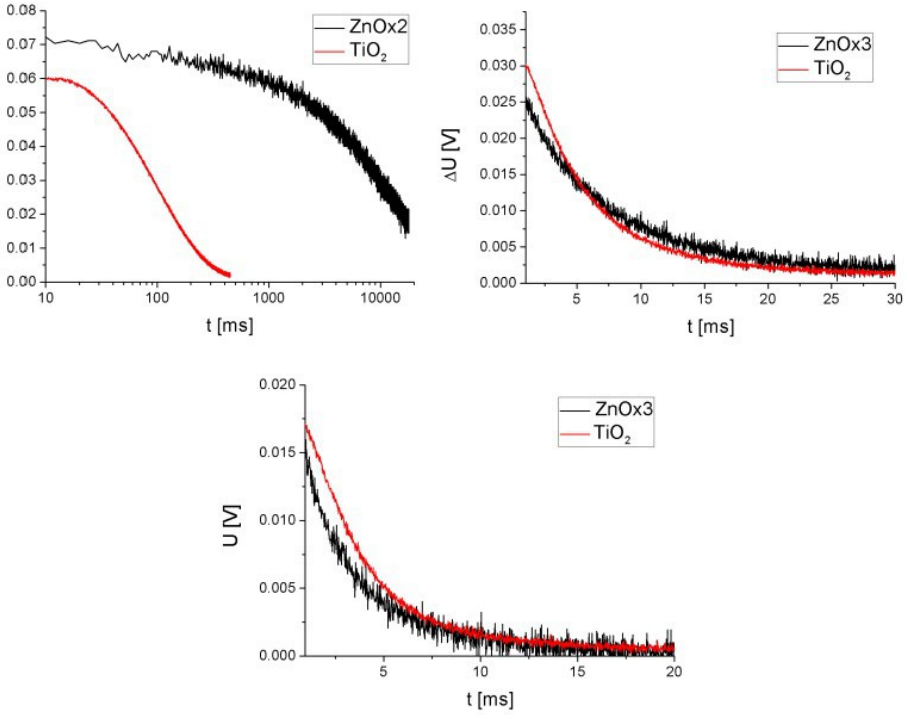

Fig. 2 Photovoltage decay curves with 1MΩ dark (top left), 1MΩ light (top right) and 50Ω (bottom)