Electrodeposition of Nanostructured ZnO Films for Dye-Sensitized Solar Cells

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Abstract. ZnO is an attractive material for dye-sensitized solar cell applications (DSSC) because it has similar properties to TiO$_2$ and nanostructured, mesoporous films can be synthesized directly by electrochemical deposition [1]. The electrochemical method provides the benefits of control over the ZnO film thickness, short fabrication time and low synthesis temperature; in addition, electrodeposition provides control over the morphology if the variables are properly tuned. Promising efficiencies have been reported for dye-sensitized solar cells based on electrodeposited ZnO where the morphology of ZnO was controlled by additives or other deposition parameters [2,3]. However an exploration of the electrodeposition variables and new additives to control the morphology is attractive in order to further improve the ZnO film properties.

In this work we report on the electrodeposition of ZnO using pulsed current and direct current on F-doped SnO$_2$ (FTO) from Zn(NO$_3$)$_2$ baths, with and without polyethylene glycol (PEG) as an additive. We relate the electrodeposited ZnO film morphology to the performance of the solar cells. The morphology of the electrodeposited ZnO film was characterized by SEM, the layer thickness was determined by profilometry.

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