E1-44: Sensitization of ZnO photoanode by ruthenium bipyridyl complex

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A dye-sensitized solid state photoelectrochemical cell based on n-ZnO films was constructed using a simple deposition technique to coat n-ZnO on CTO glass. Ruthenium bipyridyl complexes were used as the sensitizer and KI/I_2 in acetonitrile was used as the electrolyte. The counter electrode was a platinum-coated CTO glass plate.

A paste of ZnO was prepared by grinding ZnO with few drops of 25% HNO_3 acid. A thin layer of ZnO was applied on a CTO glass ($1x1.5cm^2$) using a glass rod and sintered at 450°C for 4 min. The plate was then coated with the dye by warming in a solution of the ruthenium complex in ethanol. A droplet of electrolyte was applied on the dye-coated plate and the platinum counter electrode was placed on top of it.

In direct sunlight (800 W/m^2) the cell generates a short-circuit photocurrent of ~ 8.0 mA/cm^2 and open circuit voltage of ~ 680 mV. The I-V characteristics showed considerable rectification and an efficiency of 5.0% in sunlight (800 W/m^2). The cell is highly stable and the efficiency could be further increased by improving the nano porous structure of the ZnO film.