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Abstract
In this research, the fabrication technique of nano-Titanium-Dioxide（TiO2）porous thin film electrode, which applied in dye-sensitized solar cell (DSC), was investigated. The main items include（I）preparation of nano-Titanium-Dioxide powders, (II) screen printing the thin film electrode, (III) determining the temperature range for calcination process of thin film electrode (IV) investigating the features of calcinated thin film electrode with the adsorption of dye, (V) Testing the performance of packed DSC.

Three kinds of TiO2 powders were investigated. Two of them were made from the mixture of TiCl4 + NH4OH, and TiCl4 + urea that was known as Sol-Gel precipitation process. Another was commercially obtained powders. Their grain size was smaller than 30nm that was believed to possess better area to mass ratio and activity. After the analysis for different powders in the process of calcinations by the TEM images, crystalline phase, grain size, grain aggregation and thermogravimetric analysis, it was decided to choice the commercial TiO2 powders （Anastasia phase）as the material to make thin film electrode as work electrode in the dye sensitized solar cell.

The thin film electrode was first applied on the surface of conductive glass by screen printing from the paste, which is made of TiO2 powders, organic solvent, and dispersant. Then the thin film needs to be calcinated to get rid of organic solvent and to form firm electrode. By analyzing the thermogravimetric and crystalline phase variation during calcination process, it was found the temperature range should maintain in 400 to 500℃, because the TiO2 powders can keep Anatase phase, which is favorable to the performance of work electrode.

The calcinated TiO2 thin film was identified to possess hydrophilic property while DI water reduces its contact angle on the thin film under the sunlight exposure. The influence of dye （porphyrins derivate TCPP）adsorption with calcinated TiO2 thin film was also identified by X-ray photoelectron Spectroscopy (XPS).

The counter electrode is prepared electron beam evaporation to produce Platinum （Pt）electrode with thickness about 50nm, that help the reduction process of the electrolyte. After work electrode and counter electrode were made. The electrolyte was ready to infuse from the holes, diameter of 1-2mm, on glass surface. Finally the packed DSC was tested for its performance under the sunlight exposure.
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