Wanchai Deeloed 2014: Synthesis and Characterization of 1-D Nanostructured TiO_2 on FTO Substrate. Master of Science (Chemistry), Major Field: Chemistry, Department of Chemistry. Thesis Advisor: Assistant Professor Surachai Thachepan, Ph.D. 86 pages.

Densely packed films of the nanosized TiO_2 crystals on Fluorine-doped Tin Oxide (FTO) glass substrate has been employed as the working electrode of the dye-sensitized solar cell (DSSC). Although the compact nanocrystalline TiO_2 film beneficially provides a large proportion of a specific surface area, the random pathway of electron in the film decreases device efficiency due to high possibility of the recombination of the charge carriers. Hence, this work focuses on a making of linear route for electron transportation by substituting the nanocrystalline film on the FTO substrate with the 1-D nanostructured TiO_2 film.

Two synthesis methods, template-assisted synthesis and hydrothermal synthesis, were employed in this study. The 1-D nanostructured TiO_2 on FTO substrate was successfully prepared by using the hydrothermal route in the presence of Cl^- ions. By using either the other types of substrate, Teflon and normal glass slide, or another specie of anion, SO_4^{2-}, the required nanostructure was not obtained. The crystallization of the 1-D nanostructured TiO_2 on the FTO substrate is believed to occur with the association of epitaxy relationship and surface roughness of substrate. This synthesis yielded the preferred oriented rutile TiO_2 nanorod film. This lead to the disappearance of both the (110) and (100) reflections of the TiO_2 in the XRD analysis.

The electrochemical impedance spectroscopy (EIS) was employed to investigate the electrical performance of the synthesized TiO_2 electrode and compared with the result obtained from the as-prepared nanocrystalline electrode. The comparison show that the 1-D nanostructured TiO_2 films have a lower charge-transfer resistance than the nanocrystalline film.

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