Photoelectrochemical Properties of TiO₂ Electrodes Prepared Using Chemical Functionalized Binders

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Chemically functionalized plant oils such as acrylated epoxidized soybean oil (AESO) and maleinized acrylated epoxidized soybean oil (MAESO) were used as new bio-based binders for TiO₂ electrodes of dye-sensitized solar cells (DSSC). More porous networks and larger porosities were fabricated on the TiO₂ films using plant oil binders due to the larger number of functionalities, in comparison with the film using polyethylene glycol (PEG). The charge-transfer resistance in the TiO₂ films was considerably shrunk due to the reduced impurity states. The short circuit photocurrent (Isc) and the open circuit photovoltage (Voc) of the cell using plant oil binders increased and the conversion efficiency improved significantly.

Acknowledgment

This research was financially supported by the Ministry of Educations, Science Technology (MEST) and Korea Institute for Advancement of Technology (KIAT) through the Human Resource Training Project for Regional Innovation.

Key words: Binder(바인더), Dye-sensitized Solar Cells(염료감응형태양전지), Efficiency(효율), Plant oil(식물성기름)

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TiO_2 전극과 $\mathsf{Ru}(II)$ 염료와의 흡착에 있어서 온도 및 pH 의 영향

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Influence of Temperature and pH on Adsorption of $Ru(\Pi)$ Dye from Aqueous Solution onto TiO_2 Films

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A TiO₂ films in dye-sensitized solar cells was fabricated using TiO₂ colloidal sol prepared from titanium iso-propoxide used as a starting material by applying the sol-gel method. It was characterized by particle size analyzer, XRD, FE-SEM, and BET analysis. The adsorption isotherms of dye molecule on TiO₂ films were obtained at three different temperatures (30, 45, 60 °C) and at three different pH (3, 5, 7). The adsorption kinetics of dye molecule on TiO₂ films were obtained at three different temperatures (30, 45, 60 °C). The adsorption experimental data were correlated with Langmuir isotherm model and pseudo-second-order model. Also the isosteric enthalpies of dye adsorption were calculated by the Clausius-Clapeyron equation. In addition, the adsorption energy distribution functions which describe heterogeneous characteristics of nanocrystalline TiO₂ film surface were calculated by using the generalized nonlinear regularization method. We found that efficient adsorption of N719 dye from aqueous solution onto TiO₂ films can be successfully achieved by dye adsorption conditions and morphology of TiO₂ films.

Key words: Adsorption(흡착), TiO₂ film(TiO₂ 전국), N719 dye(N719 염료), Dye-sensitized solar cells(염료감응형 태양전지)

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