Photoelectrochemical Properties of TiO_2 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 TiO_2 electrodes of dye-sensitized solar cells (DSSC). More porous networks and larger porosities were fabricated on the TiO_2 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 TiO_2 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.

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

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TiO_2 전극과 Ru(Ⅱ) 염료와의 흡착에 있어서 온도 및 pH의 영향

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

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A TiO_2 films in dye-sensitized solar cells was fabricated using TiO_2 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 TiO_2 films were obtained at three different temperatures (30, 45, 60 ^{o}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 ^{o}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 TiO_2 film surface were calculated by using the generalized nonlinear regularization method. We found that efficient adsorption of N719 dye from aqueous solution onto TiO_2 films can be successfully achieved by dye adsorption conditions and morphology of TiO_2 films.

Key words : Adsorption(흡착), TiO_2 film(TiO_2 전극), N719 dye(N719 염료), Dye-sensitized solar cells(염료감응형 태양전지)

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