NIR 흡수 염료를 이용한 염료감응형 태양전지

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Synthesis and Photovoltaic Performance of NIR Absorption Dyes for the Dye Sensitized Solar Cell

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The dye-sensitized solar cell (DSSC) is a device for the conversion of visible light into electricity, based on the sensitization of wide bandgap semiconductors. The performance of the cell mainly depends on a dye used as sensitizer. The absorption spectrum of the dye and the anchorage of the dye to the surface of TiO2 are important parameters determining the efficiency of the cell. Generally, transition metal coordination compounds(ruthenium polypyridyl complexes) are used as the effective sensitizers, due to their intense charge-transfer absorption in the whole visible range and highly efficient metal-to ligand charge transfer.

However, ruthenium polypyridyl complexes contain a heavy metal, which is undesirable from point of view of the environmental aspects.

Moreover, the process to synthesize the complexes is complicated and costly. Alternatively, organic dyes can be used for the same purpose with an acceptable efficiency. The advantages of organic dyes include their availability and low cost.

We designed and synthesized a series of organic sensitizers containing long wavelength absorption-chromophores for the dye sensitized solar cell.

The DSSC composed of Blue-chromophores for the sensitization absorbed long wavelength region which is different also applied into the dye-cocktail (mixing) system. The photovoltaic property of DSSCs organic long wavelength absorption-chromophores were measured and evaluated by comparison with that of individual chromophores.

Key words : Dye sensitized solar cell(염료감응형태양전지), long wavelength (장 파장), Organic dye(유기염료)

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Pt-ZnO 상대전극을 가지는 염료감응형 태양전지의 광전변환 특성 분석

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Enhanced catalytic activity of Pt counter electrodes employing ZnO nanorods for dye-sensitized solar cells

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In order to increase the energy conversion efficiency of dye-sensitized solar cells (DSSCs), we employed a counter electrode that was platinum coated using a doctor blade technique on synthesized ZnO nanostructures on fluorine-doped tin oxide (FTO). The ZnO nanostructures possessing high electrochemical activity and large surface area of the counter electrode were grown by a chemical bath deposition (CBD) method at various times, 2, 4, and 8 h. The efficiency of DSSC with the Pt-ZnO counter electrode was improved 7.01% (grown for 2 h), 7.63% (grown for 4 h), and 6.13% (grown for 8 h), respectively. Compared with a standard DSSC without ZnO nanostructures, whose efficiency was 6.27%, the energy conversion efficiency increased approximately 22% for the DSSC with the Pt-ZnO (grown for 4 h) electrode. It indicates that the Pt coated on the ZnO nanostructure improves the electrocatalytic activity of the counter electrode.

Key words : Dye-sensitized solar cells(염료감응형 태양전지), Counter electrode(상대전극), ZnO nanorods(산화아연 나노로드), Chemical bath deposition(화학적 용액 성장법)

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