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The Study of Electrode Structure for Dye-Sensitized Solar Cell
염료감응 태양전지를 위한 전극구조 연구

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Dye-sensitized solar cell (DSSC) is a new type of photoelectrochemical solar cells composed of a dye-modified wide band semiconductor electrode, a counter electrode, and an elecrolyte containing a redox couple. Due to low fabrication cost, permanence, environmental compatibility, and simple process, interest in DSSC has grown considerably. In spite of the cost-efficiency of DSSC, for practical application the improvement of efficiency and long-term stability is inevitable.

One of the most important problems is the recombination of photo-injected electrons in conduction band of semiconductor with the oxidized dyes and triiodide in the electrolyte. In this study, to reduce the recombination rate, we provided inherent energy barrier between semiconductor and electrolyte using the second material by electrochemical method. The new structure TiO_2/ZnO/Dye photoanode was prepared by one-step cathodic electrodeposition in aqueous solution contains $Zn(NO_3)_26H_2O$ and dye at room temperature. When this new structure electrode was applied in a DSSC, I_{SC}, V_{OC}, and fill factor were increased due to a decreased recombination rate and an improved stability of the adsorbed dye molecules.

In addition, to improve not only the electrocatalytic activity of counter electrode by increasing the active surface area of the Pt but also the adhesion on the substrate, we prepared a new type counter electrode consisting of a Pt nanosized phase in an amorphous porous metal oxide phase using a cosputtering system.