Photoelectric Characteristics of MgO-coated TiO_2 Films Used for Dye-sensitized Solar Cell

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Core-shell type nanoparticles with TiO_2 cores and MgO shells were prepared, and their photoelectric characteristics for dye-sensitized solar cell were also investigated. High resolution transmission electron microscopy (HRTEM) clearly exhibited MgO-coated TiO_2 nanoparticles and the resultant dye-sensitized MgO-modified TiO_2 films showed maximum photoelectric conversion efficiency, 2.1 % at 0.06 wt% addition of MgO as shown in figure 1. The photocurrent-voltage characteristics showed that the variation of efficiency for MgO-modified TiO_2 films was closely related to the short circuit current density. These photoelectric characteristics depending on the amount of MgO addition were discussed in terms of competition of two factors such as the amount of adsorbed dye and the resistivity of MgO-modified TiO_2 film. UV-visible spectroscopy revealed that MgO layer improved dye adsorption characteristics as shown in figure 2. On the other hand, the deterioration of solar cell property resulting from large amount of MgO addition was ascribed to abrupt increase in resistivity of MgO-modified TiO_2 film.

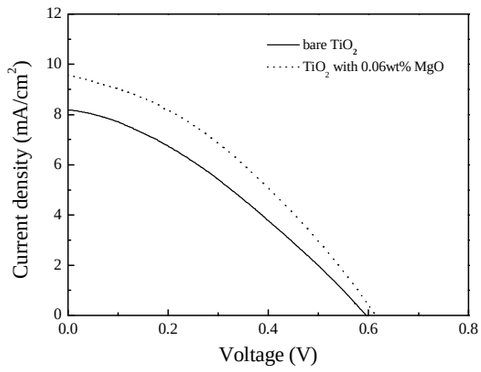

Fig. 1. Photocurrent-voltage characteristics of dye-sensitized solar cells.

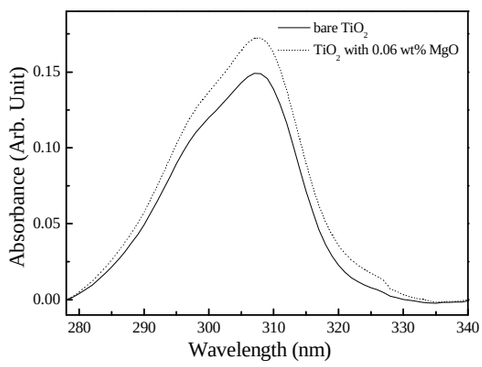

Fig. 2. UV-visible spectrum of dye which desorbed from bare TiO_2 and MgO-modified TiO_2 films.