

Application of Dye-Sensitized Solar Cell with Vertically Aligned TiO₂ Nanorods employing Various Type Electrolytes

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We present a facile and effective method to prepare vertically aligned TiO₂ nanorods (NRs) with a high density and rutile/anatase mixture phases on transparent conducting oxide (FTO) glasses. Following application of a hydrothermal process and calcination at 450 °C, vertically well-aligned TiO₂ NRs with diameters of 70 nm and lengths of 3 μm were generated, as confirmed by field emission scanning electron microscopy (FE-SEM) and X-ray diffraction (XRD).

The anatase TiO₂ nanoparticles grafted with hydrophilic poly(oxyethylene) methacrylate (POEM), which can coordinate to a TiO₂ precursor such as Ti(BuO₄), were introduced in the presence of glycine. When liquid electrolyte was used, the DSSC exhibited an efficiency of 5.7 % at 100 mW/cm², which is the highest value for DSSCs fabricated with NRs directly grown on TCO substrates. Also, high cell efficiencies of 4.5 and 3.7 % were also obtained with quasi-solid-state and solid-state electrolytes, respectively.