Synthesis and Characteristics of Morphology Controlled Titanium Dioxide for Dye-Sensitized Solar Cells

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TiO_2 nanotubes are made by treating TiO_2 powder with NaOH followed by hydrothermal treatment. The shape and structure of the TiO_2 nanotubes are determined by the precursor, number of moles of NaOH, temperature, reaction time, and washing process. In this research, TiO_2 nanotubes that crystallize at low temperatures were synthesized and their structural characteristics were examined.

After a TiO_2 sol was made via the sol-gel method, it was subjected to hydrothermal conditions to increase the specific surface area and obtain high purity TiO_2 by regulating the particle size and shape of the nanotubes.

$H_2Ti_3O_7$ appeared at 180 °C. The structure of the nanotubes was affected by the hydrothermal reaction temperature. The TiO_2 particles turned into TiO_2 nanotubes due to the condensation polymerization of OH^- and H^+, which were weakly bound. The NaOH concentration of 10M was the most effective for the synthesis of TiO_2 nanotubes.