

Synthesis of various TiO₂ nanostructures including single crystalline brookite, and their application: Photoelectrochemical cell and field emission

최민기, Zhuo Zhang, 용기중†

POSTECH

(kyong@postech.ac.kr†)

In this research, various TiO₂ nanostructures were synthesized on titanium foil, by facile one-step hydrothermal reaction. Synthesized TiO₂ can have four morphologies which are sheet, tube, wire, and pyramidal shape. The morphology was observed using SEM and TEM, and the crystalline structure was confirmed by SAED pattern of TEM and XRD analysis. As a result of TEM and XRD analysis, we found wire, sheet, and tube structures were anatase, and pyramidal structure was brookite.

The photoelectrochemical properties and the field emission properties of various TiO₂ nanostructure were measured. The brookite had the highest photoelectrochemical properties compared to other morphologies of anatase with similar length. The field emission properties which can be affected by the morphologies of emitter of various TiO₂ nanoarrays were measured in vacuum chamber. Diverse length of the TiO₂ nanowires and nanotubes showed different field emission properties, and they were analyzed and optimized by theoretical calculation with “Zero Thickness Charge Disc (ZTCD)” model.