

나노포러스 $\text{TiO}_2\text{-ZrO}_2$ 박막 재료의 합성 및 밴드갭 조절

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Unique electronic and optical properties of TiO_2 provide it with utility in chemical sensing and photocatalysts, and solar cell applications. The nanoporous TiO_2 thin films have been spin-coated from Pluronic P123 ($\text{EO}_{20}\text{PO}_{70}\text{EO}_{20}$) as the templating agent, titanium alkoxide ($\text{Ti}(\text{OR})_4$) as the inorganic precursor, and butanol as a solvent. The control of electronic structure of TiO_2 is very crucial for its various applications. We have found that the band gap of the hybrid nanoporous thin films is easily tuned by adding $\text{Zr}(\text{OR})_4$ precursor in the precursor solution state. Pore structures of a diameter of 5 nm ~ 10 nm are randomly dispersed and partially connected inside the films, confirmed by high resolution SEM. The band gap changes have been monitored by using both spectroscopic ellipsometry and UV absorption spectroscopy. Changing chemical composition of the nanoporous hybrid films has resulted in the shift of valence band edge in X-ray photoelectron spectroscopy. The refractive index has been significantly changed by varying the atomic ratio of titanium to zirconium.