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# Low Temperature Synthesis and Characterization of Sol-gel TiO2 Layers

**Sook Young Jin[1], A. S. Reddy[1], Jonghyurk Park[2], Jeong Young Park[1]**

[1]EEWS Graduate School, KAIST (Korea Advanced Institute of Science and Technology),
[2]ETRI (Electronics and Telecommunications Research Institute), Daejeon, Korea

Titanium dioxide is a suitable material for industrial use at present and in the future because titanium dioxide has efficient photoactivity, good stability and low cost [1]. Among the three phases (anatase, rutile, brookite) of titanium dioxide, the anatase form is particularly photocatalytically active under ultraviolet (UV) light. In fabrication of photocatalytic devices based on catalytic nanodiodes [2], it is challenging to obtain a photocatalytically active TiO2 thin film that can be prepared at low temperature (< 200°C). Here, we present the synthesis of a titanium dioxide film using TiO2 nanoparticles and sol-gel methods. Titanium tetra-isopropoxide was used as the precursor and alcohol as the solvent. Titanium dioxide thin films were made using spin coating. The change of atomic structure was monitored after heating the thin film at 200°C and at 350°C. The prepared samples have been characterized by X-ray diffraction (XRD), scanning electron microcopy, X-ray photoelectron spectroscopy, transmission electron microscopy, ultraviolet-visible spectroscopy (UV-vis), and ellipsometry. XRD spectra show an anatase phase at low temperature, 200°C. UV-vis confirms the anatase phase band gap energy (3.2 eV) when using the photocatalyst. TEM images reveal crystallization of the titanium dioxide at 200°C. We will discuss the switching behavior of the Pt /sol-gel TiO2 /Pt layers that can be a new type of resistive random-access memory.

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