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UV-enhanced Atomic Layer Deposition(ALD) of TiO_2 Thin Films

권용준, 장영진, 성명모
국민대학교 화학과

We have been deposited titanium dioxide(TiO_2) thin films on SiO_2 substrates using titanium(IV) isopropoxide[$Ti(OCH(CH_3)_2)_4$] and H_2O precursors by UV-enhanced Atomic Layer Deposition(ALD) method. The ALD method relies on alternate pulsing of the precursor gases and vapors onto the substrate surface and subsequent chemisorption or surface reaction of the precursors. The ALD technology with the complete surface reaction is an ideal method to deposit each atomic layer completely at a time on the substrate, and it is possible to deposit the high-quality thin films on any complicate structural surface of the substrates with controlled thickness at the atomic level. In many cases, however, the surface reactions of the ALD are not complete, which causes problems in attaining the high-quality and uniformity of the films as well as the control of films thickness. Consequently, in ALD, it is the most important to induce a complete surface reaction. We have developed new ALD technique with a complete surface reaction by using UV irradiation. The structure, chemical composition, morphology, thickness of deposited films were investigated by XRD, XPS, AFM, UV, TEM.