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Abstract
In this study, titanium oxide (TiO2) films were grown on high doped n-type Si (100) substrates by using precursors of TiCl4 and H2O in an atomic layer deposition (ALD) system. The impurity, structure, surface morphology, and roughness of TiO2 films were characterized by using AES, XRD, TEM, SEM and AFM. The film thickness was measured by α-step and the growth rate was calculated by the number of deposition cycles. The growth rate is about 0.05 nm per cycle. The XRD results show that the TiO2 films are anatase structure at deposition temperatures below 300℃ with (101) preferred orientation , and a mixture of anatase and rutile at deposition temperatures higher than 300℃. The RMS is about 7 nm for films grown at 200℃and below 2 nm for films grown at temperature of 300～500℃. The SEM images and AES spectra show that the grain size is uniform and the chlorine impurity is not detectable for all TiO2 films grown at temperature between 200 and 500℃. The transmittance by spectrometer shows that the light absorption shifts to a longer wavelength for films grown at 500℃. There is also a smallest wetting angle and highest photocurrent for films grown at 500℃.
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