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Abstract
In this study, titanium dioxide (TiO2) films were grown on n+– Si、Ti、Ta and Ni substrates by atomic layer deposition (ALD) at 200~500℃ with TiCl4 and H2O as precursors The surface morphology, crystal structure, and photocurrent of TiO2 films were characterized by using SEM , XRD, and Potentiostat, respectively.
The results show that the growth rate was not affected by process temperature and substrate types. The XRD patterns demonstrate that on Si substrates the crystalline form is anatase at low deposition temperatures of 200~400℃ and is a mixture of anatase and rutile at 500℃. The mixture structure appears at 400℃ for Ta and Ni substrates and at 300℃ for Ti substrates. According to the surface morphologies, the change of grain size with process temperature was similar for all substrates. The grain size has a minimum at deposition temperature of 300~400℃. The photoelectrochemical properties of TiO2 deposited on Ti substrates are better than those on others. In order to grow an antase TiO2 film with large grain size and low defect density, a two-stage ALD with first stage for a nucleation layer and second stage for stress release and grain growth was proposed. The photoelectrochemical properties were improved on Si and Ni substrates by the two -stage deposition.
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