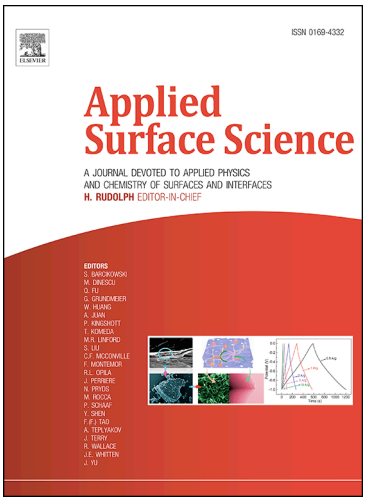

Full Length Article

Nanostructure and photocatalytic properties of TiO_2 films deposited at low temperature by pulsed PECVD

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Abstract

The nanostructure and photocatalytic properties of TiO_2 thin films deposited by PECVD on silicon substrates were investigated. The films were grown at low temperature (< 120 °C) in an rf inductively coupled oxygen/titanium tetraisopropoxide plasma, in continuous and pulsed modes with different plasma-on time (via variation of the duty cycle, DC). All the films exhibit nano-columnar structures, but the reduction of plasma-on time by decreasing the duty cycle for pulsed mode leads to a more homogenous morphology with a diminished column size, and a decrease in the surface roughness. TiO_2 layers containing a high amount of anatase were grown at substrate temperatures less than 100 °C corresponding to DC ≥ 40%, then the crystallization was hindered with the decrease of DC, even inducing amorphous films for DC ≤ 10%. Moreover, the films deposited below 100 °C with deposition conditions where 50% ≤ DC ≤ 75% were shown to present a high photocatalytic activity, likely due to the presence of anatase crystalline nanocolumns at the surface.