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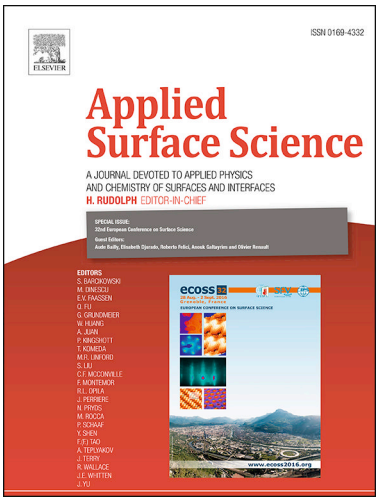

Full Length Article

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Study of nitrogen ion doping of titanium dioxide films

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This study reports on the properties of nitrogen doped titanium dioxide (TiO_2) thin films considering the application as transparent conducting oxide (TCO). Sets of thin films were prepared by sputtering a titanium target under oxygen atmosphere on a quartz substrate at 400 or 500°C. Films were then doped at the same temperature by 150 eV nitrogen ions. The films were prepared in Anatase phase which was maintained after doping. Up to 30at% nitrogen concentration was obtained at the surface, as determined by *in situ* x-ray photoelectron spectroscopy (XPS). Such high nitrogen concentration at the surface lead to nitrogen diffusion into the bulk which reached about 25 nm. Hall measurements indicate that average carrier density reached over 10^{19} cm^{-3} with mobility in the range of 0.1 to 1 $cm^2V^{-1}s^{-1}$. Resistivity about 3.10^{-1} Ωcm could be obtained with 85% light transmission at 550 nm. These results indicate that low energy implantation is an effective technique for TiO_2 doping that allows an accurate control of the doping process independently from the TiO_2 preparation. Moreover, this doping route seems promising to attain high doping levels without significantly affecting the film structure. Such approach could be relevant for preparation of N:TiO_2 transparent conduction electrodes (TCE).

Keywords: nitrogen ion doping, titanium dioxide, Anatase, transparent conducting oxide, diffusion; electronic transport.

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