PO4072

Can the normalized energy flux at the substrate control the microstructure of reactively sputtered TiO2 thin films ?

Stephanos Konstantinidis[1], Pierre-antoine Cormier[1], Romain Tonneau[2], Pavel Moskovkin[2], Stéphane Lucas[2]

[1]University of Mons, Mons, Belgium [2]University of Namur, Namur, Belgium

stephanos.konstantinidis@umons.ac.be

In order to answer the question “Can the normalized energy flux at the substrate control the microstructure of reactively sputtered TiO_2 thin films? “, we have compared the properties of the TiO_2 films synthesized in different working conditions and used the Normalized Energy Flux at the substrate (NEF) as a standardization parameter. The NEF is expressed in eV/deposited Ti atom and was obtained by combining energy flux probe data (mW/cm^2) and Rutherford Backscattering Spectroscopy results (Ti at./cm^2). The NEF was calculated for various sputtering powers and pressure x cathode-substrate distances (p x d) in two different vacuum chambers. Among other discrepancies, one could note that the chamber of the University of Mons was furnished with a single circular (7.5 cm in diameter) magnetron sputtering target while the one located at the University of Namur was furnished with two sputter targets (5.1 cm in diameter) set in a closed – field configuration. Despite the discrepancies highlighted for these two deposition systems, similar values of the NEF were obtained by varying the sputter power and the p x d values. The microstructure of the TiO_2 films deposited in these NEF conditions was obtained from Scanning Electron Microscopy and X-Ray Diffraction. Those results are discussed and atomistic kinetic Monte-Carlo simulations are performed to support the findings.

Keywords
energy flux
titanium dioxide
magnetron
phase formation
microstructure