PO1001

Improving the optical properties of titanium nitride based coatings for industrial solar thermal applications

Ramon Escobar Galindo[1], Miriam Yuste[1], Olga Sanchez[1], Jose Maria Albella[1]

[1]Instituto Ciencia Materiales Madrid, Madrid, Spain

rescobar@icmm.csic.es

Low-emissivity coatings on glass are nowadays extensively used for energy saving applications in architectural windows and on solar thermal collectors.In this work we studied the feasibility of TiN-based layers, deposited by reactive magnetron sputtering, as cost-effective low-emissivity coatings.By changing the deposition parameters, different compositions of the films (measured by Glow Discharge Optical Emission -GDOES- and Rutherford Backscattering Spectroscopy -RBS-) and different textures and surface morphologies (X-Ray Diffraction -XRD-, Atomic Force Microscopy -AFM- and Scanning Electron Microscope -SEM-) can be observed. These changes allow tuning the optical properties of the coatings, in particular, the transmission (T) in the visible range, measured by Spectroscopic Ellipsometry (SE), and the emissivity (ε), measured both directly by an emissometer and indirectly by Fourier transform infrared spectroscopy (FTIR). In order to improve the optical properties of TiN single layers we have studied the increase of T up to 17% while keeping the emittance following three methods: i)antireflectance coatings of TiO2 in multilayer structures TiO2/TiN/TiO2, ii)post-deposition annealing treatments and iii)doping the TiN layers with aluminum. Based on the control of the optical properties, and taking into account other properties such as thermal stability and long term durability, it is then possible to design selective coatings to be used in industrial solar thermal applications.

Keywords
low-e coatings
solar thermal applications
TiN