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[THF-460] Effect of sputtering parameters in the properties of TiO2 and TiN thin films

Andrés González-Hernández (angonzalez25@hotmail.com) 1 , Andrés González-Hernández 2 , Miguel Antonio Domínguez-Crespo (adcrespo2000@yahoo.com.mx) 1 , Tomás LozanoRamírez 2 , Deyanira Del Ángel-López 1 , Aidé Minerva Torres-Huerta 1 , Silvia Beatriz Brachetti-Sibaja

1 IPN, Centro de Investigación en Ciencia Aplicada y Tecnología Avanzada, Unidad Altamira. Km 14.5 Carr Tampico-Pto Industrial Altamira, Altamira Tamps. C.P. 89600 2 TecNM, InstitutoTecnológico de Cd. Madero. Ave. Primero de Mayo s/n Col. Los Mangos Cd. Madero Tamps. C.P. 89440

The titanium oxide (TiO2) thin films have been investigated in recent years for their interesting properties. It has a wide range of applications like antireflection and protective coatings, gas and humidity sensors, solar energy converters among others. The TiO2 has three crystalline structures, brookite (orthorhombic), anatase and rutile (tetragonal) each phase has characteristic properties that make them desirable for specific applications. On the other hand, the titanium nitride (TiN) is an extremely hard ceramic material and has been used in the form of thin films to increase hardness in cutting tools and as non-toxic exterior for medical implants, its crystalline phases are face centered cubic δ(TiN) and hexagonal ε(Ti2N). Both titanium thin films can be obtained by sputttering deposition, a process whereby atoms are ejected from a solid target material due to bombardment of the target by energetic particles. All the properties of these thin films can be affected by the synthesis parameters. In the present work, TiO2 and TiN films were deposited by radiofrequency magnetron sputtering (RF-magnetron sputtering) using a titanium target in glass and steel AISI 1065 substrates, respectively. The sputtering parameters of time (15 - 120 min), RFpower (100 - 200 watts), working distance (11 - 17 cm), the flow rate of Ar for TiO2 and the gas ratio of Ar/N2 for TiN were changed, to obtain different thin films and after the deposition were thermal treated to different temperatures in a range of 200 - 400 °C. The XRD patterns of TiO2 obtained with 200 watts, 120 min and 300 °C; showed the structure of anatase phase that is characterized by films color steely glint, this phase has semiconductor characteristics and is used in photocatalyst applications. The TiN films color varies strongly with the composition; in the TiN films obtained with a working distance of 17 cm, 160 watts and 150 min results in thin films color gold characteristic of the TiN. However, with major power (200 watts), the films were color blue and using a power of 100 watts the thin films were color purple, the coloration was influenced by the Ar/N2 gas ratio, the working distance and the RF-power, this can be due to the kinetic energy generated in the plasma during the collision impact of argon ions and titanium causes mixes with small amounts of oxygen generating an oxidation with sub-products like TiO2 which strongly affect the TiN properties like hardness and adhesion.