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Evaluation of carbon ultrathin films as protective layers to prevent oxidation of titanium

Carbon layers of different thicknesses were evaluated as protective layers on titanium to prevent metal oxidation. Titanium films (99.95% purity) 100 nm thick were deposited on Si (100) in a high-vacuum magnetron sputtering system with a working pressure of 5 mTorr. A Pinnacle source with 150 Watts and 20 kHz was used. The target contained surface oxide which was deposited on the substrate. With each deposition, the surface of the target became increasingly metallic, eventually enabling the formation of ultra-thin films of pure Ti. Carbon layers were deposited with a secondary sputtering magnetron with a 99.99% pure carbon target. All the samples were studied by X-ray photoelectronic spectroscopy (XPS). The XPS instrument has a 1486.7 eV Al K⍺ monochromatic source, and a 7 channeltron hemispherical spectrometer (Alpha110). The objective of the study is to find the thinnest carbon film that completely prevents the oxidation of titanium when exposed to atmospheric conditions for one month. These samples are required for synchrotron studies of the Shirley background of photoemission spectra of titanium core levels.

Keywords

photoemission spectra, XPS, carbon ultra thin films, synchrotron

Reference

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Author approval

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