

Effects of X-Ray Exposure on Physical Characteristics of Metallic Thin Films

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“Effects of X-ray Exposure on Physical Characteristics of Metallic Thin Films”

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This experiment is designed to understand the impacts of broad spectrum radiation on metallic films with emphasis on corrosion resistance. There was an analysis of depositions of films on a silicon substrate: Copper, Titanium, Titanium Nitride, Silver, and Aluminum. These deposition samples were analyzed through Scanning Electron Microscope and Energy Dispersive X-ray Spectroscopy then irradiated through a rhodium x-ray source. These atomic compositions of these samples were compared before and after x-ray exposure and determined to have an increase in oxygen composition after x-ray exposure. These x-rayed films underwent a series of acid etching tests and the x-rayed samples had an increased resistivity to corrosion. The resistivity was visual in decreased pitting in the x-rayed films. The composition of the oxide layer was analyzed through the Scanning Electron Microscope and the oxide layer was visually present in Copper when x-rayed in an oxygen rich environment. This experiment showed an increase in oxygen content for all materials irradiated with a rhodium source. Evidence suggests x-rays induced a reaction at the surface which creates an oxide layer for all materials investigated. In most instances, the oxide layer forms a corrosion resistant surface layer. Limited evidence suggests an improvement in adhesion resulting from oxygen availability at the coating and substrate interface.

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