Improving the Adhesion of Au Thin Films Onto PMMA Substrates Using Chloroform

COURTNEY WARDWELL, ALAN MO, BRIAN AUGUSTINE, CHRIS HUGHES, THOMAS DEVORE, None, JAMES MADISON UNIVERSITY TEAM — Conventional techniques such as O\textsubscript{2} plasma treatment to improve Au thin film adhesion have resulted in limited success. In this study, the adhesion of 6 nm and 100 nm Au thin films onto 0.8 mm poly(methyl methacrylate) (PMMA) sheets was significantly improved when Au thin film samples were exposed to a saturated chloroform environment after metallization. The shear force required to remove the Au films was calculated by placing samples onto a polisher spinning at 150 rpm and using a spring loaded device to apply the force. Au thin samples were characterized through optical microscopy, atomic force microscopy (AFM) and attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR). AFM and optical images show a roughening of the Au thin films after chloroform exposure. ATR-FTIR spectra indicate that residual chloroform solvent remains on the PMMA. Our research indicates chloroform may improve adhesion by relieving the stresses at the PMMA-Au interface. X-ray photoelectron spectroscopy (XPS) studies on chloroform pre-treated PMMA samples show residual solvent at the surface one-week after exposure. We have attributed this to a Lewis acid-base interaction between chloroform and the PMMA surface. We will report on the XPS data of post treated samples.

Courtney Wardwell
None

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