IN-SITU CLEANING AND PASSIVATION OF OXIDIZED CU SURFACES BY ALKANETHIOLS

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While traditionally Au is the substrate of choice for studies of thiol-derived self-assembled monolayers (SAMs), it is recognised that Cu is more interesting in terms of investigating their corrosion inhibition properties.[1] It has been reported that alkanethiols form SAMs on oxidized Cu surfaces with reduced thermal stability but are otherwise indistinguishable from those formed on metallic Cu.[2] The purpose of our study is to examine *in-situ* cleaning and subsequent passivation of oxidized Cu surfaces by thiols.

Thick CuO layers were prepared by wet chemical oxidation of Cu films. Exposure to a dilute solution of decanethiol ($CH_3(CH_2)_9SH$) resulted in the complete removal and/or conversion of the CuO layer and subsequent formation of a thiolate SAM on the underlying Cu/Cu_2O surface as evidenced by the X-ray photoelectron spectroscopy (XPS) spectra of the S 2p and Cu 2p core levels shown in Fig. 1. Corresponding O 1s, C 1s and Cu LMM regions (data not shown) further support these findings.

Morphological changes were monitored using scanning electron microscopy (SEM) as shown in Fig. 2. Such experiments performed on patterned wafers, comprising Cu bond pads used for attaching Cu or Au wires, demonstrate the potential application of an *in-situ* thiol based cleaning-passivation procedure in micro-electronics.

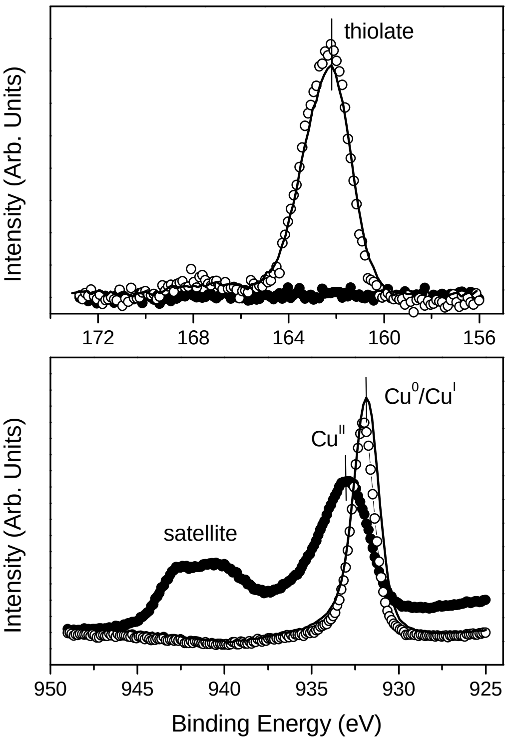

Figure 1. XPS spectra of the Cu 2p $_{3/2}$ and S 2p core levels before (●●●●) and after (○○○○) immersion of an oxidized Cu sample in a dilute solution of decanethiol. Corresponding spectra for clean Cu after (—) passivation with decanethiol are shown for comparison.

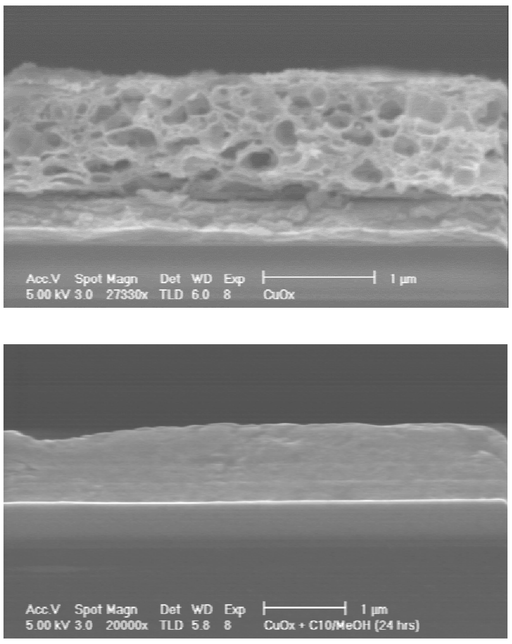

Figure 2. Cross-sectional SEM images (a) before and (b) after immersion of an oxidized Cu sample in a dilute solution of decanethiol.

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