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Observation of the high sensitivity of Positron Annihilation induced Auger electron spectroscopy to thermally induced changes in the oxidation state of Cu atoms at the surface of previously oxidized Cu(100)[1]

MANORI P. NADESALINGAM, N. G. FAZLEEV, A. H. WEISS, The University of Texas at Arlington, USA — Changes in the surface of an oxidized Cu(100) single crystal resulting from vacuum annealing over a temperature range from 20 ^{0}C to 800 ^{0}C has been investigated using Positron annihilation induced Auger electron spectroscopy (PAES). The PAES measurements show a large monotonic increase in the intensity of the annihilation induced Cu ($M_{2,3}VV$) Auger peak as the sample is subjected to a series of isochronal anneals in vacuum up to annealing temperature 300 ^{0}C. The intensity then decreases monotonically as the annealing temperature is increase to ∼600 ^{0}C. The Ps fraction, f_{PS} of these surfaces was found to have the opposite trend going from f_{PS} = 0.79 for the surface before any annealing to f_{PS} =0.51 after annealing at 300 ^{0}C. These results provide a clear demonstration of the thermal reduction of the copper oxide surface after annealing at 300 ^{0}C followed by re-oxidation of the copper surface at the higher annealing temperatures presumably due to the diffusion of subsurface oxygen to the surface.

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