

## The effect of low energy Ar<sup>+</sup> ion bombardment on epitaxy and oxidation of thin films of CuO<sub>x</sub>

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Here we present a detailed study on the growth of epitaxial CuO<sub>x</sub> thin films on single crystal substrates (MgO and SrTiO<sub>3</sub>) by MBE. *In situ* photo electron spectroscopy (XPS and UPS) is used to establish the degree of oxidation of Cu, while *in situ* electron diffraction (LEED and RHEED) monitor the crystal structure of the growing thin film. We particularly pay attention to the valence state of Cu and the crystal symmetry as influenced by a combination of the substrate, activated oxygen and a flux of low energy Ar<sup>+</sup> ions. We observe a rich variety of epitaxial relationships as a function of the flux ratios of three species on the substrate surface (ie, Cu, O<sup>\*</sup> and Ar<sup>+</sup>) which will be used to explore the possibility of the highest crystal symmetry achievable in CuO<sub>x</sub> system. The relationship between (electronic) properties and crystal structure is being investigated at different lengths using scanning probes. Although the copper system is the focus of this paper, we will also address whether such an approach is feasible for other oxide materials.

This work is supported by DOE, EPRI and Netherlands Organization for Scientific Research (VENI).