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Effect of hydrogen bulk content on the thermal removal of copper surface oxide

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Copper is often used as thin film substrate in particle accelerators, in particular for non-evaporable getters and niobium. The native copper oxide, formed on the copper surface at room temperature in air, consists mainly of cuprous oxide Cu2O. This compound is very stable and can dissociate or sublimate only at high temperatures. However, baking copper under ultra-high vacuum at 250C-300C is sufficient to reduce the oxide and generate a metallic surface. The influence of the hydrogen content in the copper bulk on the oxide reduction process has been investigated by thermal desorption spectroscopy (TDS) monitoring the hydrogen and water vapour peak signals, and by X-ray Photoemission Spectroscopy (XPS). The TDS results indicate a possible relation between the measured signals of desorbed water vapour and hydrogen. The XPS analysis as a function of heating time demonstrates that a higher hydrogen content favours a faster removal of the oxide layer.

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