

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Oxidation of MgB₂ Thin Films J. READ, Cornell, Y. CUI, Penn State, B. MOECKLY, Superconductor Technologies, J. SHU, Cornell, X. XI, Penn State, R. BUHRMAN, Cornell — We report on x-ray photoelectron spectroscopy studies of the surface oxides of high quality MgB₂ thin films grown both by reactive evaporation [1] and by hybrid physical chemical vapor deposition [2]. Depending upon the treatment of the MgB₂ surface after deposition, the oxide can contain both magnesium and boron, with a substantial variation in the Mg:B ratio. Brief high temperature ($T \geq 400$ °C) exposure of the MgB₂ surface to even near ultra-high-vacuum conditions, results in the formation of a thin mixed oxide (MgB_xO_y) and subsurface layer of elemental B due to the greater reactivity of Mg. As a result of the higher mobility of the Mg cations, prolonged exposure to the background ambient additionally results in a progressively thicker MgO surface oxide layer, and in a larger elemental B subsurface component. The surface oxide formed at \sim room temperature is more Mg rich than the initial, mixed oxide layer formed at high T. The latter is a significantly better passivating layer as indicated by the resistance of the film to water etching. We discuss these differences in surface oxide chemistry with a focus on guiding the development of thin film processes applicable to tunnel barrier formation on MgB₂. [1] B. Moeckly and W. Ruby, SUST 19, L21 (2006) [2] X. Zheng, et al., Nat. Mater. 1, 35 (2002)

John Read
Cornell

Date submitted: 02 Dec 2007

Electronic form version 1.4