Effect of accumulative roll bonding process on the electrochemical behavior of pure copper

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Abstract

In this study, the effect of accumulative roll bonding (ARB) process on the electrochemical behavior of pure copper in 0.01 M borax solution has been investigated. The microhardness tests showed that by implementing the ARB process the values of microhardness improve with increasing the number of ARB cycles. Moreover, a drastic increase of microhardness was seen (~100%) after the second ARB cycle. Potentiodynamic polarization plots and electrochemical impedance spectroscopy (EIS) measurements showed that increasing the number of ARB cycles offer better conditions for forming the passive films. In the Mott–Schottky analysis, no evidence for n-type behavior was obtained, indicating that the oxygen vacancies and the copper interstitials do not have any significant population density in the passive films. Also, this analysis revealed that with increasing the number of ARB cycles, the acceptor density of the passive films decreased.

Keywords: Copper; Corrosion; Point defects; Electrochemical impedance spectroscopy.