

THE ELECTROCHEMICAL COPPER(II) REDUCTION IN THE PRESENCE OF POLYETHYLENE GLYCOL AND CHLORIDE IONS

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The cathodic reduction of copper(II) on copper electrodes is studied in electrolytes that are comparable to Galvanic copper baths: 2.2 M H_2SO_4 + 0.3 M CuSO_4 + chloride ions ($c_{\text{Cl}} \leq 1 \times 10^{-2}$ M), and polyethylene-glycol 1500 ($c_{\text{PEG}} \leq 4 \times 10^{-3}$ M).

Electrochemical quartz-crystal-microbalance (EQCM) measurements are conducted, mainly under conditions of cyclic voltammetry. The formation and reduction of CuCl on the electrode surface at $c_{\text{Cl}} \geq 2$ mM is demonstrated, the inhibition of the charge-transfer reaction by the PEG/Cl^- surface layer is characterized, and a conspicuous shift of the pseudo-equilibrium potential associated with CuCl deposition is analyzed. Numerical simulations of the processes as well as parallel experiments conducted with electrolytes not containing Cu(II) support the proposed mechanisms, in particular the role of the intermediate Cu^+ .