



The Influence of Halide Ions on the Kinetics of Electrochemical Copper(II) Reduction

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Abstract

The cathodic reduction of copper(II) in an electrolyte comparable to technical conditions (2.2M H₂SO₄ + 0.3M CuSO₄) is markedly affected by the presence of small concentrations of halide ions. Chloride ions accelerate the reaction, while it is slowed down by bromide. Experiments in which cyclic voltammetry is combined with an electrochemical quartz-crystal microbalance reveal the deposition and dissolution of crystalline CuCl or CuBr, respectively, on the copper surface. At the technically relevant more negative electrode potentials bulk CuCl and CuBr are unstable, however halide ions are adsorbed on the copper electrode. Although there is evidence for adsorption of the reacting Cu(II) species at the electrode surface, up to a concentration of 0.3M CuSO₄ in presence as well as in absence of adsorbed halogenide, there is no evidence for limitation of the reaction rate caused by a limited coverage of the surface with this species.