Polycrystalline and single crystal Cu electrodes: influence of experimental conditions on the electrochemical properties in alkaline media - DTU Orbit (17/11/2019)

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Single- and polycrystalline Cu electrodes serve as model systems for the study of the electroreduction of CO₂, CO and nitrate, or for corrosion studies; even so, there are very few reports combining electrochemical measurements with structural characterization. Herein we investigate both the electrochemical properties of polycrystalline Cu and single crystal Cu(100) electrodes in alkaline solutions (0.1 M KOH and 0.1 M NaOH). We demonstrate that the pre-treatment of the electrodes plays a crucial role in the electrochemical properties of the electrodes. We perform scanning tunneling microscopy, X-ray photo electron spectroscopy and cyclic voltammetry on Cu(100) electrodes prepared under UHV conditions; we show that the electrochemical properties of these atomically well-defined electrodes are distinct from electrodes prepared by other methods. We also highlight the significant role of residual oxygen and electrolyte convection in influencing the electrochemical properties.