

# Dissolution of Copper in Hydrogen Peroxide Solutions

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The rate of dissolution of copper in hydrogen peroxide solution goes through a maximum then drops at higher peroxide concentrations. A similar behavior has been observed in copper CMP, where the rate of polishing exhibits a peak and then decreases as the oxidizer concentration further increases. This study seeks to uncover the chemical and electrochemical origins of these trends.

The dissolution behavior of copper in hydrogen peroxide is explained by carefully examining the chemical conditions at the metal/solution interface. The rate of metal dissolution is accurately determined using a quartz crystal microbalance, and the near-surface pH is measured. The results indicate that the copper ion concentration and the pH near the surface could increase and reach the

solubility limit of copper oxide. In this case an oxide film would form on the surface and hinder further metal dissolution. Aqueous stability diagrams are used to demonstrate this process. A simple theoretical model which takes into account the effect of surface conditions is presented. The model is shown to be in reasonable agreement with the experimental observations.