

铜电极在弱碱性介质中腐蚀行为的研究

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摘要 应用循环伏安法和现场椭圆偏光法研究了弱碱性介质中铜的腐蚀、钝化过程,并用二组分有效介质模型对光学实验结果进行了拟合。结果表明金属铜在腐蚀达到稳态时其表面氧化膜具有一定的组成和厚度;反应生成的CuO比Cu<sub>2</sub>O更为致密,因而对基体具有更好的保护作用;CuO的阴极还原过程可能会涉及到还原中间产物Cu<sup>+</sup>的歧化反应,该歧化反应的进行有助于铜耐蚀性的提高;CuO的还原可以在小于-0.45V(vs.SCE)的电位范围内与Cu<sub>2</sub>O的还原同时进行,椭圆偏光实验不仅与电化学和光电化学实验的结果一致,还能定量地确定膜的厚度、折射率等性质;并根据有效介质模型,可以计算得到不同时刻电极表面膜组成的改变;从而为研究电极反应机理提供新的证据。

关键词 [铜](#) [循环伏安法](#) [椭圆偏振光谱](#) [钝化](#) [腐蚀](#) [介质腐蚀试验](#) [电极反应](#)

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Studies on corrosion behavior of copper electrode in weak alkaline solution

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Abstract Both in-situ ellipsometry and cyclic voltammetry were used to investigate the corrosion behavior of copper electrode in borax solution. Effective-medium model was employed to analyze the optical measurement results. The theoretical results suggested that both the thickness and composition of the oxide film were definite after the electrode processes reached stable states. The divalent oxide CuO was more compact and protective than the monovalent oxide Cu<sub>2</sub>O. The disproportionation of Cu<sup>+</sup> was probably involved during the reduction process of CuO, which was helpful to improve the anti-corrosive property of the oxide film. It was shown that the reductions of CuO and Cu<sub>2</sub>O could occur simultaneously under the potential of -0.45V(vs. SCE). The optical results not only were in good agreement with the electrochemical and photoelectrochemical measurements qualitatively, but also could be used to calculate quantitatively the values of the thickness and refractive index of the surface film. According to these calculated results and the effective-medium model, the composition of the surface film, which changes with the duration of chemical reactions and provides important evidences for the reaction mechanism studies, could be determined.

Key words [COPPER](#) [CYCLOVOLTAMGRAPH](#) [ELLIPSE POLARIZATION SPECTROMETRY](#) [PASSIVATION](#) [CORROSION](#) [MEDIUM CORROSION TEST](#) [ELECTRODE REACTION](#)

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