

Dissolution characteristics of post-etch residues in aqueous solutions

고천광, 이원규*

강원대학교

(wglee@kangwon.ac.kr*)

Recently, the copper interconnection with the damascene structure has been employed to overcome the serious RC delay and metal migration issues in the semiconductor devices. Unfortunately, copper does not form a stable surface oxide layer. The use of copper introduces materials processing concerns, such as oxidation, which can negatively impact component performance and reliability. In this study, dissolution characteristics, such as the solubility of copper oxides and the complexation stability between copper ions and aqueous solutions, were analyzed under various pH conditions of citric acid aqueous solution, which are known as complexing agents for copper. The dissolution characteristics of the aqueous solutions were measured in terms of the solubility of copper oxides and metallic copper. The citric acid solution had a good solvent property for copper oxides in the range of acidic conditions. The surface roughness and the oxidation status of copper films treated with solutions having a different pH value were analyzed by atomic force microscopy (AFM) and X-ray photoemission spectroscopy (XPS), respectively. Electrochemical impedance was performed to study the effects of pH on the oxidation of copper.