Effect of PEG(Polyethylene glycol) on the anodic dissolution of copper in acid copper electrodeposition baths

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ABSTRACT

Copper metallization of chips has been the subject of an intense investigation for more than a decade[1,4,5] because of the advantages of Cu relative to Al for chip wiring such as lower resistance, higher allowed current density, and increased scalability.[1~3] And Damascene Cu electroplating for on-chip metallization, developed in the early 1990s, has been central to chip interconnection technology, in which superfilling, leads to filling trenches and vias with Cu without creating a void or seam. Several manufacturers have used copper electroplating in the presence of additives for on-chip metallization. However, it seems desirable to reduce the use of additives in these processes in view of control and monitoring of plating baths and minimization of impurity levels in the electrodeposited film. Thus, pulse-reverse current electroplating and pulsed current electroplating of copper have gained interest as well as DC electroplating in the presence of additives. In the case of pulse-reverse current electroplating, anodic dissolution of electrodeposit occurs during anodic current pulse. There have been a number of studies which address the effect of Cl^- ions and some surface active agents upon the anodic behavior of copper in sulfuric acid/sulphate solutions used for its electrodeposition, however, little is known about anodic dissolution of copper of acid copper solution containing polyethylene glycol(PEG), the most commonly used additive in acid copper electrodeposition baths.

In this study anodic dissolution of copper in acid copper solution containing polyethylene glycol(PEG) was studied by an electrochemical microgravimetric technique using EQCM. Mass reversibility was observed, however, charge reversibility was not observed during electrodeposition and dissolution of copper. Detailed analysis will be made in terms of complexing of PEG with ionic species of Cu in solution at the conference.