**The roles of complexing agents on Copper CMP**

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The major roles of complexing agents are known to increase the solubility of metal film being polished or the abraded film material, resulting in the increase of polish rate. However, proper steps should be taken to control the action of such agents. Low dissolution rate leads to the low polishing rate and redeposition of abraded material on metal surface, while high dissolution rate leads to isotropic removal of metal film accompanied by the lack of planarity after CMP. Thus the thorough understanding of the exact roles of complexing agents is the most decisive factor for achieving the best performance of CMP.[1)]

In this study, ethylenediamine and glycine were used as complexing agents. We observed the corrosion behavior of copper as a function of pH for each complexing agent. According to the experiment, there is a slight difference in copper corrosion behavior between two complexing agents in the pH range investigated. In contrast, there is a significant increase in the copper corrosion rate at higher pH in the presence of complexing agents, despite slightly different pH dependency. (Fig .1) It is likely that each complexing agents become more active in a certain pH range: ethylenediamine at pH>~6 and glycine at pH>~4.

In the meantime, concurrent using of complexing agents with oxidants such as hydrogen peroxide showed somewhat different behavior of complexing agents, especially in the case of ethylenediamine. According to the corrosion test of copper (Fig. 2), glycine-$H_2O_2$ system showed simple combined effect of each glycine and $H_2O_2$ systems, which indicated the independent action of both complexing agents and oxidant on the corrosion process. However, etylenediamine-$H_2O_2$ system showed that there seems to be some correlated actions between complexing agents and oxidants, resulting in different corrosion tendency with respect to pH conditions.

In this presentation, we will talk about the exact roles of complexing agents on copper CMP process. In addition, the resulted surface morphology and chemical state of copper surface after corrosion test, which examined by SEM and XPS, and another action of complexing agents on the suspension stability of slurry will also be discussed.

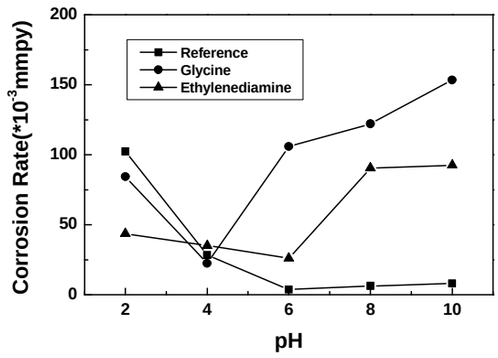


Fig. 1. Effect of complexing agents on the corrosion rate of copper in different pH conditions.

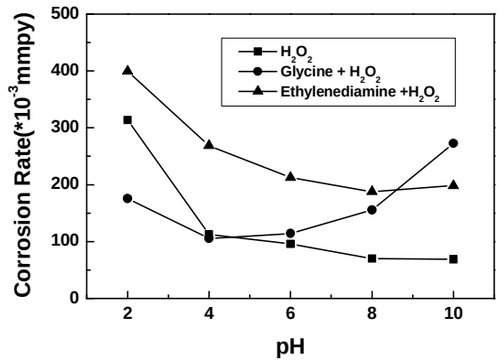


Fig. 2. Corrosion rate of copper in solution containing complexing agents and oxidants (hydrogen peroxide).

**Reference**

1. Chemical Mechanical Planarization of Microelectronic Materials, by J. M. Steigerwald, S. P. Murarka, R. J. Gutamann John Wiley & Sons, INC., New Yourk (1997).
2. Catalytic Oxidations with hydrogen peroxide as oxidant, by G. Strukul, Kluwer Academic Publications (1992).