(様式 5)

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学位（博士）論文要旨

(Doctoral thesis abstract)

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論 文 題 目 (Title)	めっき液のフォームを用いた新規無電解めっき技術の開発 (Development of novel electroless plating technique using foam of plating solution)

論文要旨(2000 字程度)
(Abstract(400 words))
※欧文・和文どちらでもよい。但し、和文の場合は英訳を付すこと。
(in English or in Japanese)

Electroless plating is an indispensable technique for metal deposition on insulating substrates. One of the problems of the electroless plating is pinhole defects in the films that result from hydrogen bubbles generated in the plating process. This thesis aims to solve this problem by achieving the deposition in a foam of electrolyte in place of the conventional plating liquid. It is expected that the foam can remove hydrogen bubbles efficiently from the surface.

Chapter 1 describes the history and current status of the plating technology. It also introduces recent advancement of electroplating that uses unconventional plating media such as foam of electrolyte as a background of this study.

Chapter 2 describes the first trial of electroless plating in a foam of hypophosphite-based solution for Ni plating added with a surfactant of sulfuric acid monododecyl ester sodium salt (SDS). Although electroless deposition barely proceeded in a stationary foam, film growth was enhanced by generating a flow of foam and by increasing the amount of SDS.

Chapter 3 describes a newly developed deposition system that can generate continuous flow of foam. Although the film growth rate in the foam was smaller than that in the conventional liquid, the film growth was enhanced with increasing flow rate of the foam. Compared to the films deposited in liquid, the films deposited in foam had smaller number of pinholes, smaller crystallite size, and superior corrosion resistance. The ferroxyl indicator test showed that the area of

corrosion can be reduced to less than 1/20 by depositing a film in foam instead of liquid.

In Chapt. 4, further improvement of corrosion resistance was achieved by optimizing the surfactant for generating the foam. Surfactants of SDS and ammonium pentadecafluorooctanoate (APFO) were added to the hypophosphite-based electroless plating solution. The films deposited in foam had smaller crystallite size than those deposited in liquid. Ferroxyl test revealed that the films deposited in foam had remarkably higher corrosion resistance than those deposited in liquid. Even with a film thickness as small as 1.5 μm, the corroded areas of the films decreased by almost three orders of magnitude by adding both SDS and APFO.

Chapter 5 summarizes these results and give a prospect of this new method. A pilot system that can circulate a continuous flow of foam gave a clue to overcome the lack of film growth rate. It was concluded the deposition in a foam of electrolyte can open a new era in the electroless plating technique by solving the problem of pinhole defects and also by reducing the amount of plating liquid.