

Characterization of initial stages of the electrodeposition of Ni, Zn and Ni-Zn alloy by EQCM

* e-mail : kidsong@yonsei.ac.kr

** e-mail : kbkim@yonsei.ac.kr

Ki-Deok Song* and Kwang-Bum Kim**

Department of Metallurgical Engineering, Yonsei University,

134 Sinchon-dong Seodamun-gu, Seoul, Korea

ABSTRACT

Electrodeposition of zinc-nickel alloys is of interest of their significantly higher corrosion resistance than that of pure zinc. The electrodeposition of zinc-nickel alloys from aqueous plating baths reported to be a codeposition of the anomalous type; that is, the less noble component, zinc, deposits preferably with respect to the more noble nickel.

Several mechanisms have been suggested for the preferential deposition of zinc in these systems. Fleischmann *et al.* demonstrated that the codeposition of atomic hydrogen and nickel, in the form of β -Ni or α -Ni solid solution, occurs in an acidic solution on a glassy carbon substrate. Epelboin *et al.* proposed that an autocatalytic mechanism of hydrogen evolution, with adsorption of H-Zn, occurs in alkaline solution. However, none of the previous investigations made *in-situ* observation of the initial stages of electrodeposition of Ni, Zn and Ni-Zn alloys. And the interactions between nickel, zinc and hydrogen codeposition remains unclear since only electrochemical measurements were performed and the alloy composition was analyzed after electroplating.

In this study, the influence of deposition of hydrogen, as well as nickel and zinc was made during the initial stage of electrodeposition of Ni-Zn alloys from acidic sulfate solution by EQCM. EQCM results have shown **that the anomalous Ni-Zn electrodeposition is caused by the preferential formation of zinc hydroxide on the cathode and thereby prohibited reduction of Ni²⁺ and H⁺ ions.** More detailed discussion of the data will be made in the conference.