IRON-NICKEL ALLOY THIN FILMS PREPARED BY ELECTRODEPOSITION ON INDIUM TIN OXIDE COATED GLASSES

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ABSTRACT

In this study, Fe-Ni alloy thin films are prepared by electrodeposition under diverse conditions, which include varying amounts of iron and nickel ions in electrolytes; varying amounts of additives in electrolytes; applying an external magnetic field during preparation; and measuring the types of in-situ monitoring electrochemical cells for investigating the deposition of Fe-Ni alloy thin films. In addition, the crystal structure of Fe-Ni alloy thin films are identified by x-ray diffraction analyses, showing a mixture of body-centered cubic (BCC) and face-centered cubic (FCC) structures. Flame atomic absorption spectroscopy (FAAS) and X-ray absorption spectroscopy (XAS) are used to investigate the amounts of Fe-Ni metal in alloy thin films. The deposition rates of Fe-Ni alloy thin films are shown in the Fourier component of iron and nickel ions, which is measured by time-resolved x-ray absorption spectroscopy. These results are confirmed through the static XAS results in which the oxidation states of iron and nickel are zero. Saccharin, an additive, can increase the iron crystalinity in Fe-Ni thin films. In the presence of an applied magnetic field, a decrease of the iron BCC-phase is observed whereas in the nickel FCC phase the alloy thin films were not significantly affected. Using FAAS measurements, the ratios of iron and nickel atoms in thin films are different from those ratios in the electrolytes and there were higher deposits of iron ions than those of nickel ions.

KEY WORDS: Fe-Ni ALLOY THIN FILM / ELECTRODEPOSITION / TIME-RESOLVED X-RAYS ABSORPTION SPECTROSCOPY

123 pages