Periodic Change in the Ni Content in a Co-Ni Thin Film Electrodeposited Using a Rectangular Pulse Current over a Megahertz Frequency Range

M. Saitou

University of the Ryukyus, Department of Mechanical Systems Engineering, 1 Senbaru Nishihara-cho
Okinawa, 903-0213, Japan.

E-mail: saitou@tec.u-ryukyu.ac.jp

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Co-Ni thin films electrodeposited using a rectangular pulse current over a megahertz frequency range were investigated. Energy dispersive X-ray spectroscopy identified a resonant frequency at which the Ni content in the Co-Ni thin film had a maximal value. A periodic change in the Ni content in the Co-Ni thin film emerged at a constant resonant frequency interval of 0.1 MHz between the neighboring resonant frequencies. X-ray diffraction analysis showed that a Co-Ni thin film containing more than 33 wt% Ni had a face-centered cubic (FCC) crystal structure, and that containing less than 28 wt% had a hexagonal close-packed (HCP) crystal structure. This indicated that the phase transition between the FCC and HCP structures occurred at the critical Ni content. The periodic change in the Ni content in the Co-Ni thin film was explained by an energy level transition of electrons that caused a resonant generation of Co and Ni.

Keywords: Co-Ni thin film; Energy level transition; Resonant frequency; Resonant frequency interval; Phase transition; FCC; HCP

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