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Abstract
In this study, the Co nanowire arrays prepared using the arrays nanoporous of anodic aluminum oxide membrane as a template (AAO template) with electrodeposition method. The diameter of AAO pores is about 300 nm. The Co nanowire arrays are deposited by various electrolytic condition, and the optimum electrolytic conditions has been investigated. And also the growing phenomenon, microcrystalline structure and magnetic properties are investigated in the presence of ultrasonic irradiation with a various irradiation power density.
As in the absence of ultrasonic irradiation, the rates of Co nanowires deposition increase with increasing deposition potential. Co nanowires almost do not deposite when the deposition potentials are positive than -0.7 V vs. Ag/AgCl. In addition, the Co nanowires do not grow uniformly when the deposition potentials are negative than -1.3 V vs. Ag/AgCl. However, the Co nanowires could be deposited in the deposition potential range of -0.9 V to -2.0 V vs. Ag/AgCl. On the other hand, when the deposition potential is -1.1 V vs. Ag/AgCl which can be deposited optimum and uniformly Co nanowires.
The rates of Co nanowires deposition also increased with increasing irradiation power density in the presence of ultrasonic irradiation. In addition, the rates of deposition had a significant increase while ultrasonic irradiation power density is above 15 W. The microstructures of Co nanowires have not significant different compared with that of in the absence of ultrasonic irradiation as the irradiation power density small than 12W. On the other hand, when irradiation power densities above 15 W, the preferred growth orientations of Co nanowires changed from hcp(002) and fcc(111) to hcp(100). In addition, when the AAO nanopores are almost fill, the preferred growth orientations of Co nanowires have a significantly changed compared with the AAO nanopores are not fill. The slopes of the hysteresis curves increase with increasing of the irradiation power density, e.g., the nanowires could be easy to magnetize. The coercivities of Co nanowire arrays are all among 70- 82 Oe, anyway the ultrasonic irradiation is added or not.
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