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Abstract
In this study, the Ni-W-P nanowire arrays prepared using the arrays nanoporous of anodic aluminum oxide membrane as a template (AAO template) with an electroless method. The influence of pH value of electrolyte on the properties of deposited alloy nanowire during pH4.5~9.5 range with electroless have been investigated. The structure of deposited alloy nanowires are amorphous structure in varieus pH value ranges that electrolyte pH value (4.5~9.5) by XRD analysed. The composition of deposited alloy nanowires have only Ni and P as pH value for 6.5 under, what there is no W appearing. There is W appeared and formed Ni-W-P alloy nanowire when pH value aboves 7, and the W content will increase with the increase of electrolyte pH value. On the other hand, amount of the W composition approach a maximum value while electrolyte of pH 8.5, however, the alloy nanowire can,t be formed well. Therefore, the range of pH7~8 can be formed good nanowire. The magnetic properties of deposited alloy nanowires with the range of pH pH7~8(ie: the W content are 4~6 wt%) have been structure by VSM analysed. This result indicate that there is a highest saturated magnetization exists under the pH8 condition. Therefore pH value of electrolyte and the W content in the alloy nanowire affect significantly on the nanowire growth morphology and properties magnetism.
The Ni-W-P alloy nanowire growth mechanism has been investigated. When electrolyte flow through the catalyzes surface and the alloy particles have been deposited on these surface, and the alloy particles becomes the tubular structure upward autocatalytic to pile up again forms Ni-W-P alloy nanowire structure. On the other hand, except has nanowire formation, still has nanoparticles and nanotube structure exists on the bottom of AAO. The influence of nanotubular and nanoparticles on the magnetic can be neglected.
The influence of the concentration (10~20 g/L) of Na2WO4 in electrolyte has been investigated. The result indicated that the content of W in Ni-W-P alloy nanowire is increased with increasing of the concentration of Na2WO4 in electrolyte. When the Na2WO4 concentration is 15 g/L, The W content in the Ni-W-P alloy nanowire can reach to 16wt%, also may produce the growth mechanism specially, and the length of nanowire is near 15 μm. The saturation magnetization quantity for this condition to be highest near 534emu/cm3. Therefore, the Na2WO4 concentration is the very important parameter.
The influence of the concentration of NiSO4(10~20 g/L) and NaH2PO2(17~27 g/L) in electrolyte on the properties of deposited alloy nanowires have been studied. From these results indicate the

concentration of $NiSO_4$ and NaH_2PO_2 can obviously affect the composition of Ni-W-P nanowire. The lower $NiSO_4$ concentration and higher NaH_2PO_2 concentration may obtain the higher W content in the Ni-W-P alloy nanowire. Therefore, the deposited Ni-W-P alloy nanowire using the electrolyte pH value is 8, and electrolyte composition of Na_2WO_4 15 g/L, NaH_2PO_2 22 g/L and $NiSO_4$ 15 g/L can be obtained the better nanowire morphology and the best magnetic property.
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