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Study the effect of symmetrical voltage of electrodeposition and annealing temperature on magnetic properties of Fe-Sn alloy nanowires

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Abstract

In this research, the Fe-Sn alloy nanowires were made by AC electrodeposition method in anodic aluminum oxide (AAO). The effect of different symmetrical voltages of electrodeposition (17.5-32.5 V) and annealing temperature on magnetic and structural properties of Fe-Sn nanowires were investigated. The magnetic properties, morphology, element composition of materials and crystal structure of the nanowires were studied by AGFM, SEM, EDX and XRD, respectively. The results showed that, coercivity field (H_c) and square ratio (S_q) increases by increasing deposition voltage and also, crystallinity of the nanowires and resulting their crystalline magnetic anisotropy increased, but deposition percentage of Sn to Fe reduced. The H_c and S_q of prepared nanowires were increased by annealing due to increases in their crystalline structure and crystalline magnetic anisotropy. The most variation in H_c and S_q were achieved for prepared nanowires at 30 V.

Keywords: nanowire, electrodeposition, aluminum oxide template, square ratio, coercivity field

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