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Synthesis of CoZn nanowire in anodic aluminum templets and their characterization by Rutherford backscattering spectrometry

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Abstract

In this research, the CoZn alloy nanowire arrays were deposited in a porous aluminum oxide template by alternative current pulse electrodeposition. The aluminum oxide template was fabricated through two-step soft anodization of pure aluminum foils and its morphology was determined using a scanning electron microscope.

In order to systematically study the constructed sample, non-destructive ion beam analysis techniques were used. Among these methods, Rutherford backscattering spectrum analysis was performed by interaction of proton ions with energy of 2000 keV and 2500 keV and helium ions with energy of 2500 keV with the sample. Analysis of the RBS spectrum of the sample along with simulations performed by SIMNRA code made it possible to determine the concentration, depth profile of the elements in the sample, and determination of stoichiometry of the alumina template at different depths. The best results are related to a proton with energy 2500 keV, which reported the depth of 10 to 14 μm for CoZn alloy nanowire. Also, for validation of the results, FE-SEM images were prepared from the sample, which confirms the agreement with the results obtained from the RBS method.

Keywords: ion beam analysis, Rutherford backscattering spectroscopy, anodic aluminum oxide, depth profile of elements, CoZn nanowire

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