

ABSTRACT

Dissertation work: 78 pages, 25 figures, 8 tables, 41 literatures.

THIN FILM, TIN, NICKEL, Ni-Sn, PHASE TRANSFORMATIONS, INTERMETALLICS, STRUCTURE.

The object of the study: processes of structural phase transitions in nanoscale compositions film Ni / Sn during deposition and after heat treatment.

The aim of the work: to explore patterns forming intermetallic phases during deposition and after annealing.

The methods of the research: resistive evaporation in a vacuum, transmission electron microscopy, electronography analysis, mass spectrometry of secondary ions and X-ray analysis.

Scientific novelty of the results:

1. It is shown that the structure of the newly obtained nanoscale film tracks intermetallic phase Ni_3Sn was found. Also in the structure of bilayer films Ni (60 nm) / Sn (30 nm) intermetallic Ni_3Sn_4 is present.

2. It is established that annealing of two-layer film compositions Ni (60 nm) / Sn (30 nm) in a vacuum at a temperature of 500 C for 90 s leads to a redistribution of components and the formation of intermetallic phases (Ni_3Sn , Ni_3Sn_2 , Ni_3Sn_4). However, heat treatment leads to an increase in grain size by 16%.

3. It was found that the diffusion coefficient of the process is $9 \cdot 10^{-13} \text{ (cm}^2 / \text{s)}$.

Scientific results obtained in this paper are of interest in terms of research phase and structural reforms thin-film systems, and to improve the technology of thin film anode materials for lithium-ion batteries.