

Multiple phase-formation in Ni-Ge system monitored by SEM, AFM and PIXE analytical techniques

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Abstract

We present evidence of multiple phase formation in the Ni-Ge system observed with the aid of the Scanning Electron Microscope (SEM), Atomic Force Microscope (AFM) and Particle Induced X-ray Emission (PIXE) analytical techniques. Using a conventional optical mask, we prepare lateral diffusion couples of thick rectangular germanium islands on a nickel thin film [1]. We observe at elevated temperatures a lateral diffusion of excess atoms from the Ge rich island to the surrounding Ni thin film; in a process which leaves a sequence of clearly discernible multiple phases whose interfaces are optically resolvable. We reveal finer detail in structure, texture and stoichiometry of the phases using AFM and SEM micrographs together with RBS (Rutherford Backscattering Spectrometry) spectra and PIXE elemental distribution maps. Our results confirm that when complemented with AFM, SEM and PIXE, lateral diffusion coupling technique is the most effective method to observe simultaneously multiple phases in a metallic-semiconducting binary system.

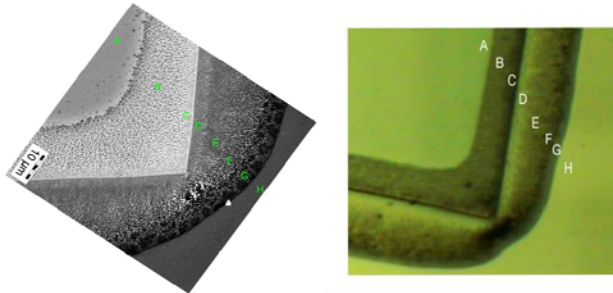


FIG 1: An SEM (left) micrograph displayed together with the corresponding optical image clearly showing multiple phases of nickel-germanides formed on a lateral diffusion couple with germanium rich islands deposited on nickel thin film.

Refs:

1. C. Churms, C.M. Comrie and R.S. Nematudi, *Nuclear Instruments and Methods in Physics Research B*, 158(1-4), 1999, p713