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Probing isothermal and non-isothermal annealing of Sn/Ti bimetallic thin films using Rutherford Backscattering Spectrometry (RBS) as a probing tool.

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Solid phase reaction studies induced by heat treatment processes on Sn-Ti bimetals often lead to changes in microstructural features and enhanced properties and give new insight on the performance of these systems for industry applications. In this study, thin layers of tin and titanium with varying thicknesses of 15 nm and 25 nm were deposited by Molecular Beam Epitaxy (MBE) on a silicon dioxide substrate. The films were then isothermally annealed at temperatures of 700 oC for 5 hours, 10 hours, and 900 oC for 1 hour in vacuum. Non-isothermal annealing was performed by femtosecond laser irradiation (1030 nm wavelength, 300 fs pulse duration, and 500 kHz repetition rate) at a laser fluence ranging from 76 J/cm2 to 227 J/cm2. The surface morphology and microstructural features of the thin films were investigated by atomic force microscopy (AFM) and scanning electron microscopy (SEM) before and after heat treatment. Rutherford Backscattering Spectrometry (RBS) was used to study the compositional changes of the films. AFM analysis revealed that the surface roughness of the films increased from 5.8 nm to 86.3 nm as the laser fluence increased. RBS also confirmed the increase in surface roughness with laser fluence. However, surface roughness was not observed in the vacuum-annealed samples, which leads to the conclusion that they remained smooth after isothermal annealing under vacuum. Other compositional changes observed were ablation on the laser-scanned samples and the existence of new phases being formed in both vacuum-annealed and femtosecond laser-annealed samples.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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