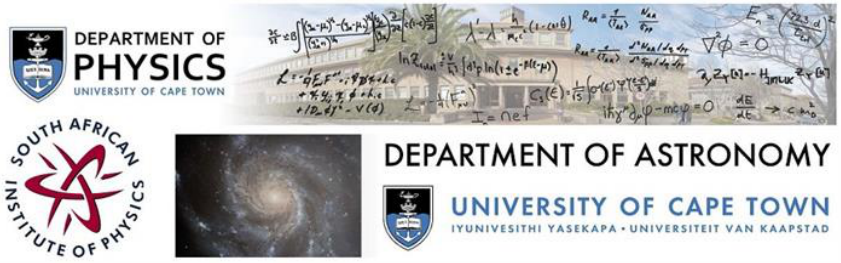

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Evaluation of sputtering-induced surface roughness of polycrystalline Ni/Cu multilayers thin films with AES and ToF-SIMS depth profiling

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Abstract content
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Auger Electron Spectroscopy (AES) and Time-of-Flight Secondary-Ion Mass Spectrometry (ToF-SIMS) in combination with ion beam sputtering are frequently used for performing composition-depth profiling of thin films. During the sputter depth profiling of polycrystalline metal thin films, sputtering-induced surface roughness is the main source of the degradation of the depth resolution. Ni/Cu polycrystalline multi-layered structures were deposited on a SiO2 substrate by means of electron beam evaporation in a high vacuum. The true concentration-depth profiles of Ni/Cu multi-layered specimens were determined utilising the Mixing-Roughness-Information depth (MRI) model by fitting measured data (concentration-depth profiles) obtained by AES and ToF-SIMS depth profiling. The MRI model used for calculation of the true concentration-depth profiles accounts for the broadening upon experimental depth profiling owing to the effects of atomic mixing, surface roughness and the information depth of the Auger electrons (for AES depth profiling) or secondary ions (for SIMS depth profiling). The depth-dependent depth resolution and ion sputter-induced surface roughness upon depth profiling of the as-deposited sample were quantitatively evaluated.

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