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Study of the interdiffusion in Ni/Cu multilayer thin films by Auger electron spectroscopy depth profiling

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Abstract content
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Multilayer thin films have been increasingly used in both basic research and applications because of their special physical properties that differ from those of the bulk materials and single-layer thin films.[1] Inter-diffusion at the interfaces is one of the most important processes influencing the properties of a thin-film system. [2] Auger electron spectroscopy (AES) in combination with ion sputtering could be one of the most powerful methods for the determination of the interdiffusion coefficient for thin films. Recently, based on the so-called Maxing-Roughness-Information depth (MRI) model, a new method that fits a calculated AES depth profile to the entire measured AES depth has been proposed for extracting the interdiffusion parameters.[3] The interdiffusion upon annealing Cu/Ni multilayer structures at 325 °C, 350 °C and 375 °C for 30 min has been studied by AES depth profiling. The Cu/Ni multilayer structures were deposited on a SiO2 substrate by means of electron beam evaporation in vacuum. After deposition the multilayer structures were annealed in vacuum. The measured AES depth profiles of the unannealed and annealed samples are quantitatively fitted by the MRI model and the interdiffusion parameters, pre-exponential factor D0 and activation energy Ea, have been extracted. The depth-dependence of the interdiffusion coefficient in the Cu/Ni multilayer structures is characterized.

References:
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[2] R. Pretorius, T.K. Marais, C.C. Theron, Mater. Sci. Eng. Rep.10 (1993) 1
[3] J.Y. Wang, A. Zalar, Y.H. Zhao, E.J. Mittemeijer, Thin Solid Films 433 (2003) 92.

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