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AES study of surface segregation in Ni-Cu alloy thin films

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Surface segregation in a thin film is different from that in a bulk system, due to the fact that the number of segregated atoms on the surface of the thin film is a significant fraction of the total number of atoms and resulted that the bulk concentration in the thin film is modified significantly upon segregation. In addition, significant differences in the surface segregation behavior, as compared with that in the bulk material [1,2], due to the lack of a reservoir of segregating atoms, may occur. Surface segregations of Cu in the Ni-Cu alloy thin films was measured using Auger electron spectroscopy with the linear temperatures programmed heating method. The samples were heated at a constant rate of 0.03 K/s from 403 K to 823 K. It was found that the surface enrichment factor β of segregation for a thicker sample (52 nm) is higher than that for a thinner sample (26 nm). The measured segregation data was fitted with the modified Fick's model and the bulk-to-surface diffusion parameters for Cu in the Ni-Cu alloy thin films were extracted, which compared well with those in the literature.

References:

- [1] S. Swaminarayan, D.J. Srolovitz, Surface segregation in thin films, Acta Mater. 44 (1996) 2067-2072.
- [2] X. L. Yan, J. Y. Wang, Size effects on surface segregation in Ni-Cu alloy thin films, Thin Solid Films 529 (2013) 483-487.

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Primary author: Dr YAN, Xin Liang (Shantou university, China)

Co-authors: Prof. SWART, Hendrik (University of the Free State); Prof. TERBLANS, JJ (Koois) (UFS); Prof. WANG, Jiang Yong (Shantou University)

Presenter: Dr YAN, Xin Liang (Shantou university, China)

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