DE LA RECHERCHE À L'INDUSTRIE

Séminaire

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Salle de réunion du SRMP – Bâtiment 520 - Pièce 109

Grain boundary diffusion and segregation in bi- and tri-crystals

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Diffusion of Ag in low-Σ grain boundaries of Cu is investigated. The radiotracer technique and the ^{110m}Ag isotope are applied. Ag diffusion in Cu near Σ5 and Σ17 bicrystals is measured parallel and perpendicular to the (001) misorientation axis in both, C and B kinetic regimes after common Harrison's classification. For the first time, the grain boundary diffusion coefficients of a single grain boundary in a true dilute limit of the solute concentration are determined in the C kinetic regime and the values of triple products $P = s\,\delta\,D_{gb}$ are measured in the B regime (here s and δ are the segregation factor and the diffusional grain boundary width, respectively). A significant anisotropy of the grain boundary diffusion in Σ5 boundary is established which disappears at the temperatures above 823 K. This temperature corresponds also to a kink in the Arrhenius temperature dependence of the triple product. The phenomenon is discussed in term of a special-to-general transition of the grain boundary structure.

The anisotropy of the product s δ for a single grain boundary is determined. The effect of non-linear segregation on Ag diffusion in the Cu bicrystal is elucidated via controlled variation of the total amount of the applied tracer material. Specific radiotracer experiments on general and special Σ5: Σ5: Σ25 tri-crystals are performed and the results are discussed with respect to probable contribution of the triple junction diffusion.

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