Defect and Diffusion Forum Vols. 66-69 (1990) pp. 861-868
online at http://www.scientific.net

Defect and Diffusion Forum Vols. 66-69 (1989) pp. 861-868

DIFFUSION PARAMETERS, GRAIN BOUNDARY STRUCTURE AND DIFFUSION MECHANISM IN THE VICINITY OF THE Σ 5 COINCIDENCE MISORIENTATION IN COPPER

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Diffusion of Ni along the Σ5/310/ near-coincidence symmetric tilt boundaries in copper has been studied. The results obtained show that the Brandon model can be applied for description of the boundary structure within a small range in the vicinity of the coincidence misorientation at temperatures below 1057 K /the temperature of Σ5/310/ structure disordering/. Beyond this range the boundary structure is likely to have the O-lattice periodicity. A transition from one structure to another is accompanied by an abrupt jump of the grain-boundary diffusion coefficient. It is difficult to account for this jump in the framework of the model of "structure units", according to which, the grain boundary diffusion coefficient between "delimiting boundaries" varies monotonously.

In an approximation of parallel diffusion fluxes the Arrhenius parameters have been determined for the diffusion along the Σ5/310/ coincidence boundary structure /$2.0 \cdot 10^{-12}$ m^3/s, 147 kJ/mol/ and along the GBD cores /$1.45 \cdot 10^{-16}$ m^3/s, 64 kJ/mol/.

We have observed a compensation effect. Closeness of the compensation temperature to the Σ5/310/ structure transformation temperature allowes us to assume that an elementary act of diffusion along the Σ5/310/ structure can be related to the formation of an activated complex, consisting of one or of several elements of the structure lying above 1057 K.