

Additional results of the study

“New comments on the Melting Entropy of Binary Eutectic Alloys without solid state Solubility“

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ec-lyon.halscience/hal-04032265v1 18 /03/2023

The Al-Be eutectic system has been taken here as an example with a very small  $\Delta S E$  value (near zero).

Taking into account the crystallographic parameters and the bulk self diffusion constants  $D_0$  given by the literature (9) (14) :

Al (F.C.C.)	$a = 0.4049 \text{ nm}$	$D_0 = 1.71 \cdot 10^{-4} \text{ (m}^2 \text{ / sec)}$ (14)
Be (C.P.H.)	$a = 0.2285 \text{ nm} //$	$D_0 = 0.62 \cdot 10^{-4} \text{ (m}^2 \text{ / sec)}$ // (c axis)
	$c = 0.3584 \text{ nm} \perp$	$D_0 = 0.52 \cdot 10^{-4} \text{ (m}^2 \text{ / sec)}$ $\perp$ (basic plane)

For Be, the self-diffusion results have been obtained with single crystals along two directions (along the // (c axis), and the  $\perp$  (basic plane) (14)).

So, the vibration frequencies obtained with the frequency factors  $D_0$  are for each element :

$$\begin{aligned} \nu(\text{Al}) &= 4.46 \cdot 10^{+13} \text{ Hz} & \nu(\text{Be}) &= 5.08 \cdot 10^{+13} \text{ Hz} // \text{ (c axis)} \\ & & \nu(\text{Be}) &= 1.73 \cdot 10^{+13} \text{ Hz} \perp \text{ (basic plane)} \end{aligned}$$

Considering the medium value of  $\nu(\text{Be})$  in the bulk as a first approximation, that is  $3.4 \cdot 10^{+13} \text{ Hz}$ , the ratio  $\nu(\text{Be}) / \nu(\text{Al})$ , or the reverse ratio  $\nu(\text{Al}) / \nu(\text{Be})$ , is finally near the value : 1, value which is very lower than the all other results for the cases studied previously in § 3 (page 4). This means, when  $\Delta S E = 0$ , that the vibration frequency of the two elements is probably the same near the interfaces during the final solid  $\rightarrow$  liquid transformation, like for a pure metal in the grain boundaries at its melting temperature and according the Gibbs phases rule.

(9) Barrett C.S. Structure of metals Mc Graw Hill N.Y. 646 – 649 (1952)

(14) Lundy T.S., Murdock J.F. (Al) and Dupuy J.M., Mathia J., Adda Y. (Be)  
References in Adda Y., Philibert J. La diffusion dans les solides Tome II  
Presses Universitaires de France Paris, 1129 and 1132 (1966).