Size mismatch effects on the atomic transport properties of copper and potassium-based liquid alloys

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- Abstract

We have used the quasi-chemical approximation, Darken’s thermodynamic equation of diffusion and the model of Singh and Sommer to study the size mismatch effects on the transport properties of Cu–Pb, Cu–Tl, K–Pb and K–Tl liquid alloys.

The results obtained shows that using the same fitted value of order energy, $W/k_B T$: size mismatch has more effects on the transport properties of K–Tl, a heterocoordinated alloy with size ratio of 2.62 than on K–Pb, a heterocoordinated alloy with size ratio of 2.43 and surprisingly, the effects of size mismatch on the transport properties of Cu–Tl, a homocoordinated alloy with size ratio of 2.27 is more than on Cu–Pb, a homocoordinated alloy with size ratio of 2.45; size mismatch causes a cross-over from decrease to increase in the degree of chemical ordering in K–Pb and K–Tl while in Cu–Pb and Cu–Tl it leads to a cross-over from decrease to increase in the degree of phase separation depending on the composition of K and Cu in their respective alloys.