

Measurement of the Soret coefficient in liquid Al-Ag alloys using X-ray radiography

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Thermodiffusion, also called Soret effect, is the separation of the components of a mixture toward the hot/cold regions in a nonuniform temperature distribution. The effect is observed to influence a wide range of systems, from ocean water over magma and crystal growth to stellar plasma.

For several organic mixtures the Soret coefficients have been measured with high accuracy [1]. However, for liquid alloys only very few Soret coefficients are known, the reasons being the experimental challenges at the required high temperatures, such as convection, and difficulties of direct analysis.

We present our work on determining the Soret coefficient of liquid aluminium–silver in a concentration range of 20 to 55 at.% Ag, using X-ray radiography (XRR). Silver is observed to migrate to the cold side.

Thanks to the in-situ measurements with XRR, the transient concentration separation can also be analysed, which makes determination of the inter-diffusion coefficient possible. This inter-diffusion coefficient is then compared to literature values on the same system [2], corroborating the measured Soret coefficient.

[1] J.K. Platten, M.M. Bou-Ali, P. Costesèque, J. F. Dutrieux, W. Köhler, C. Leppla, S. Wiegand and G. Wittko, *Philos. Mag.*, 83, 1965 (2003).

[2] M. Engelhardt, A. Meyer, F. Yang, G.G. Simeoni and F. Kargl, *Defect and Diffusion Forum*, 367, 157 (2016).