

## Viscosity of Industrially Important Al-Zn Alloys

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Viscosity is a very important property in several fields of metal processing, like the fluid flow behavior, kinetics of metallurgic process, among others. Despite this fact, industry still needs new data for several pure metals and alloys, as the available data frequently shows large discrepancies and the effect of minor components, important in melting and phase stratification, and in the thermophysical properties, is very difficult to model. One of the main reasons is the technical difficulty in measuring the viscosity at high temperatures, a task that is both challenging for the experimentalists (and time consuming) and for the theoretical interpretation. In this paper we report the viscosity of molten Al-Zn alloys, for temperatures between 420 and 641 °C, performed with an oscillating cup viscometer [1], with an estimated uncertainty of 2-5 %, depending on the alloy. Almost no data on thermophysical properties and solid-liquid phase equilibria exist for these new alloys. Density was estimated from the available data for the pure components [2]. For this alloys, with a composition of aluminum ranging from 5 to 55 %, and with other minor components such as Mg, Pb, Si and Fe, the variation of viscosity with temperature does not show an Arrhenius type behavior. This might be caused by the complex variation of the multicomponent liquid viscosity, and will be discussed in terms of the fusion behavior and available models for the variation with temperature [3].

[1] Nunes, V.M.B., Santos, F.J.V. and Nieto de Castro, C.A., “A High Temperature Viscometer for Molten Materials”, *Int. J. Thermophys.*, 18, 427-435 (1998)

[2] Ilida, T., Guthrie, R.I.L., “*The Physical Properties of Liquid Metals*”, Clarendon Press, Oxford, 1988.; Steinberg, D.J., “Density of Liquid Ni-Cr Alloy”, *Met. Trans.*, 5, 1341 (1974)

[3] Chhabra, R.P. and Tripathi, “A Correlation for the Viscosity of Liquid Metals”, *High Temp. High Press.*, 25, 713 (1993)