

Viscosity of Industrially Important Al-Zn Alloys, with High Al and Si Contents

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Viscosity is a very important property in several fields of metal processing, like the fluid flow behavior and kinetics of metallurgic process. In recent years some experimental efforts have been devoted to measuring and correlating the viscosity of pure molten metals and some alloys, as reported in our previous work and references therein [1]. The effect of minor components in the thermophysical properties is very difficult to model, and our knowledge of such effects in the fluid flow is far from being acceptable. We report in this paper the viscosity of molten Zn-Al alloys, for temperatures between 693 and 915 K, performed with an oscillating cup viscometer [2], with an estimated uncertainty of 3-5%, depending on the alloy. These alloys have a composition of Al and Si higher than the alloys previously studied by us [1]. Zn-Al are very important materials in die casting process and galvanizing processes, as the Al is important in increasing the fluidity, and also offers an important protection against steel corrosion. Special care was taken to interpret some complex melt/solidification processes of the melts, by using DSC and SEM/EDS analysis. In this work (part II) we concluded that an increase in the amount of Mg gave origin to a complex melt/solidification process, the addition of Ce and La turns the viscosity of the alloys almost temperature independent (in the interval studied), and the increase in Al and Si content decreases the viscosity giving origin to a melt with an Arrhenius type behaviour.

1. Nunes, V.M.B., Lourenço, M.J.V., Santos, F.J.V. and Nieto de Castro, C.A., "Viscosity of Industrially Important Alloys. I - Quasi-eutectic Alloys", *Int. J. Thermophys.*, 31, 2348-2360 (2010)
2. Nunes, V. M. B., Santos, F. J. V., Nieto de Castro, C. A., "A High Temperature Viscometer for Molten Materials" *Int. J. Thermophys.*, 18, 427-435 (1998)