

Thermal Analysis of Aluminium 7075 prior to Semisolid Metal Processing

N A Razak^{1,a)}, A H Ahmad^{1,b)}, and M M Rashidi^{1,c)}

¹*Manufacturing Focus Group, Faculty of Mechanical Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia.*

^{a)}*Corresponding author: azhani@ump.edu.my*

^{b)}asnul@ump.edu.my

^{c)}mrashidi@ump.edu.my

Abstract. Thermal analysis method is broadly used to determine solidification characteristics of metals and alloys in numerous metallurgical processes. This paper presents the relationship between fraction solid and temperature of wrought aluminium 7075 alloy at different cooling rate conditions. The 7075 was heated in a graphite crucible to a temperature of 750 °C by an induction heating machine. A K-type thermocouple was located at the center of the crucible and was immersed within the molten metal to a depth of 15 mm from the top of the graphite crucible. The temperature and time profiles were recorded with a Data Logger GL-220 which was connected to a notebook with GL software. Three different cooling rate conditions (normal, intermediate, and high) were carried out with the crucible was set in the open atmosphere, in open atmosphere with minimum airflow over the crucible, and in open atmosphere with maximum airflow over the crucible, respectively. Based on the obtained cooling curves data, the enthalpy of phase change at respective temperature was determined. Results show that the calculated cooling rates for normal, intermediate, and high cooling rates were at 2.23 °C/s, 2.88 °C/s, and 3.20 °C/s respectively. The variations of cooling rate were found directly related to phase transformation during solidification including at liquidus, eutectic and solidus temperatures.