Melting Temperature and Latent Heat of Fusion of Indium

Understanding the thermal behavior of a material can be very useful to manufacturers who melt metals and alloys such as in casting parts or soldering electronic components. Knowing the melting temperature and latent heat of fusion can help to prevent overheating the molten metal unnecessarily and reduce energy costs. It can also help to prevent other issues caused by overheating a melt including increased oxidation, melt container corrosion, and mass loss through evaporation. In soldering electronics applications, it can help to eliminate possible damage to critical components due to overheating.

Differential scanning calorimetry (DSC) is an analysis technique that is widely used to analyze the thermal behavior of a material. DSC can be used to determine phase transition temperatures, the enthalpy of such transitions, and reaction kinetics. It is an indispensable tool for determining melting temperature and latent heat of fusion.

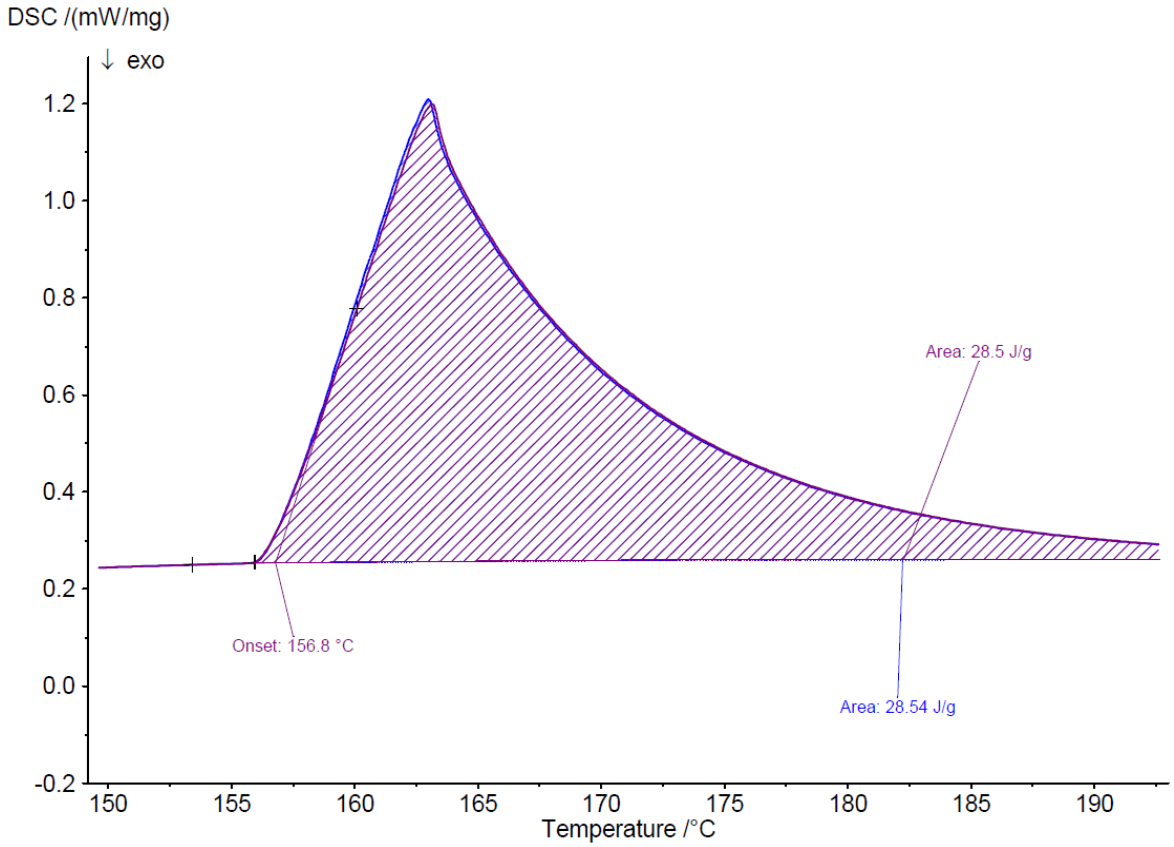

Figure 1. DSC curves of two test runs for the melting of indium.

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Indium metal is commonly used in lead-free solder applications. In reflow soldering, the entire printed circuit board is subjected to temperatures slightly above the solder's melting temperature. Understanding the thermal behavior of indium-rich solder in such applications can be crucial to fine-tuning the process in order to reduce processing time and cost.

Figure 1 presents two overlapping DSC data curves obtained in two test runs for melting indium. The tests were performed on an Ebatco NAT Lab's Simultaneous TG-DTA/DSC Apparatus STA 449 F3 Jupiter manufactured by Netszch (Germany).

The average melting temperature for the indium sample was measured as 156.8^{o}C. The sample's latent heat of fusion was measured as 28.52 kJ/kg.