5N PLUS

Product Data Sheet

MCP 200/Metspec 390 Alloy

UPDATED ON 2012-07

TYPICAL USES

MCP 200 alloy is used almost exclusively in spraying applications. These are mainly based on the MCP range of spray guns, designed for rapid formation of alloy moulds for plastics such as polyurethane's.

The alloy is suitable for thermal protection devices designed to yield at 197^{0}C.

PHYSICAL PROPERTIES

MCP 200 is probably the eutectic of the Tin-Zinc system, although there is some conflict in the published data (see overleaf).

In common with all alloys of low melting point, MCP 200 undergoes equilibration after solidification. Although melting behavior depends on the age and thermal history of the alloy, the observed differences are of much less significance than those seen in alloys based on Bismuth, which melt within a much lower temperature range, where the changes are slower and usually more complex.

The alloy when molten is susceptible to dross formation through oxidization and a protective atmosphere is recommended. Pressurized nitrogen is preferable to air as the motive gas in spraying.

Characteristic	Typical Value
Density	7.27 g/cm^3
Brinell Hardness	21.5
Melting Point	197 °C
Specific heat at 25°C (solid)	0.239 J/g.°C
Specific heat at 120°C (liquid)	0.272 J/g.°C
Enthalpy of fusion	71.2 J/g
Electrical Resistivity	11.2 mΩ.cm
Thermal Conductivity	0.61 J/sec.cm.°C

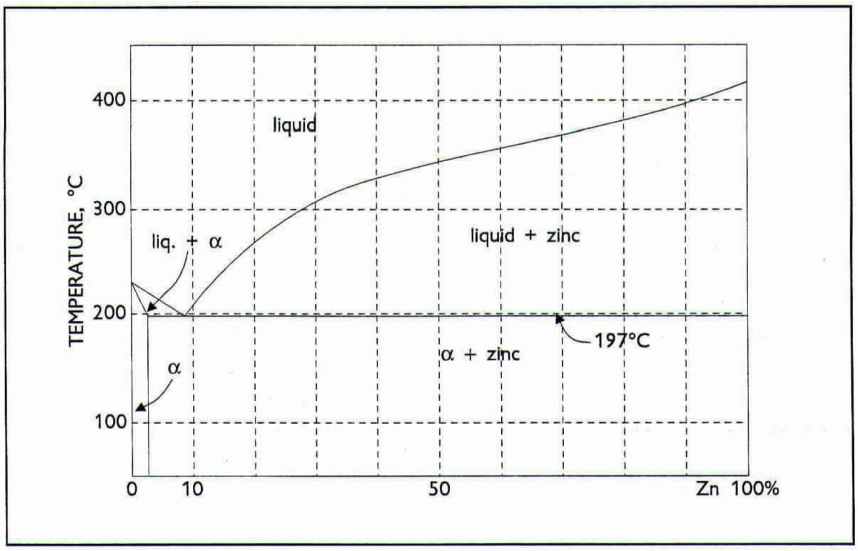

Fig. 1 THE TIN-ZINC PHASE DIAGRAM

The diagram is based on published date (e.g. M. Hansen & K. Anderko, 'Constitution of Binary Alloys;' C.J. Smithells, "Metals Reference Book").

The eutectic composition (9.0% wt. of Zinc) and temperature (197^{0}C) are values based on measurements made by 5N Plus Inc.

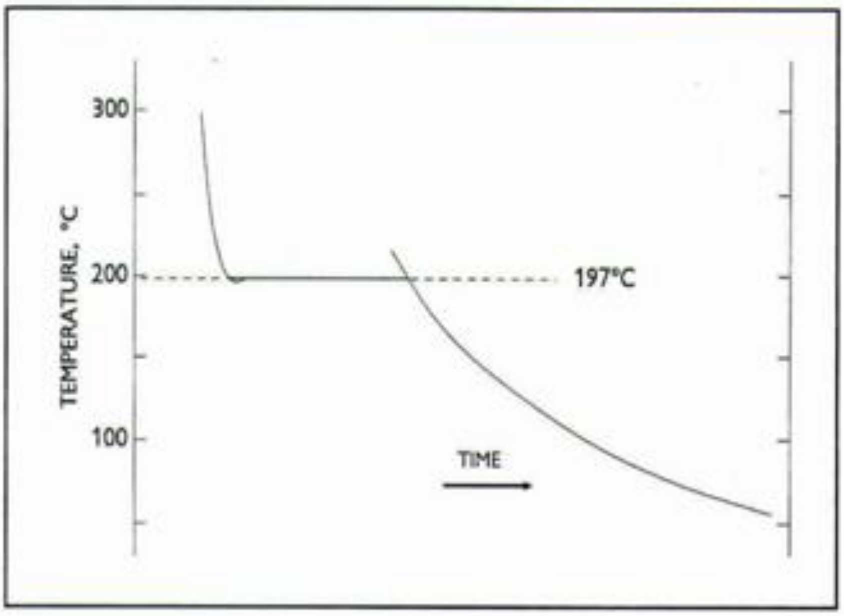

Fig. 2 SOLIDIFICATION

The trace obtained by solidification from a homogeneous melt of a sample of 300g indicates a precise arrest at 197^{0}C, which follows a short supercooling.

There is no post-solidification evidence from this diagram of further reaction. For this alloy the level of plateau defines very precisely the eutectic temperature, which may be compared with the onset values found in melting of both newly solidified and matured samples (fig. 3).

[1] The analytical purity is determined by ICP (Inductively Coupled Plasma)

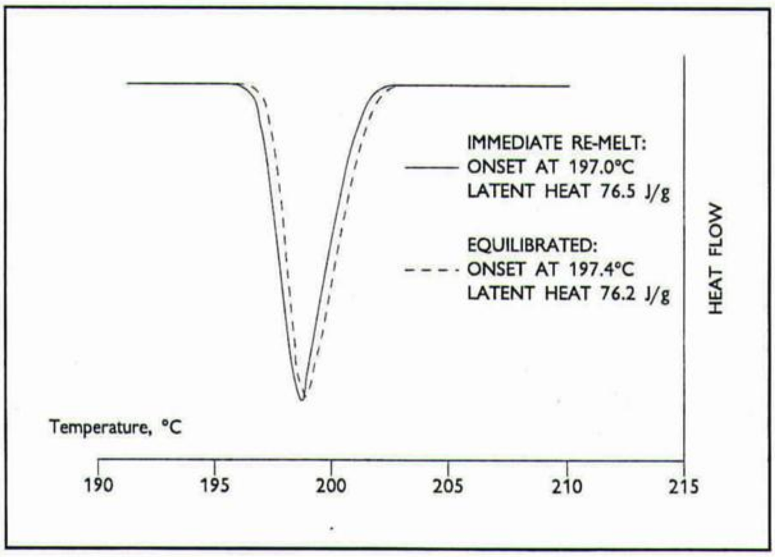

Fig. 3 MELTING

The minor structural changes that take place after solidification are made apparent by the technique of differential scanning calorimetry (DSC). The behavior of matured alloy is here compared with that of a newly solidified specimen.

The onset temperature for melting is found to have altered slightly in older specimens. The virtual absence of structural changes after solidification is demonstrated by the similarity in melting behavior between specimens of different ages (or which have been subjected to different conditioning).

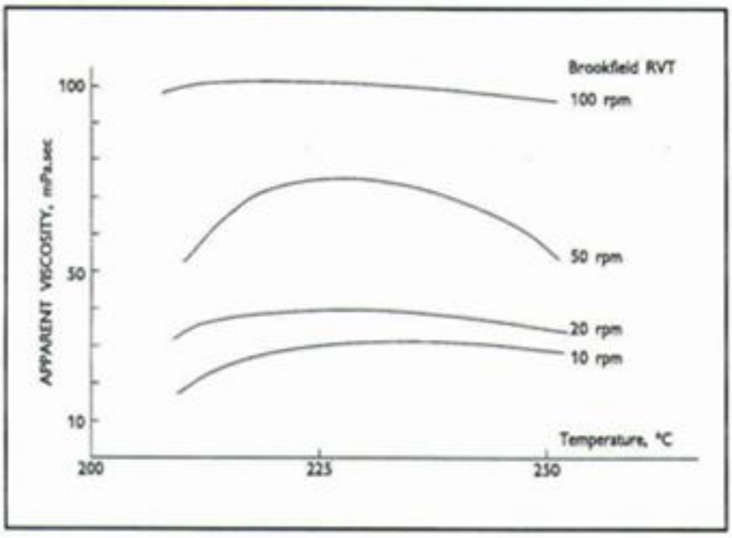

Fig. 4 VISCOSITY

Like that of most alloys of low melting point the viscosity of MCP 200 is quite low and apparently Non-Newtonian. However, the data shown are un-doubtedly influenced by the circumstances of measurement and, not least, by the high surface tension of the alloy, especially close to its melting point.

The values indicated in the diagram were obtained by means of a Brookfield RVT viscometer, using 3 liters of liquid alloy in a cylindrical container with alloy depth being roughly equal to the diameter. The figure illustrates changes apparent under conditions such as might be encountered in practical use. Viscosity is, in fact so low that it is not a large consideration in designing systems for circulating large quantities of alloy.

STORAGE AND USE

Store products in their original packaging.
Wear protective equipment recommended by the Safety Data Sheet.