

## EUTECTICS AND PERITECTICS IN THE SOLIDIFICATION PROCESSING OF NB SILICIDE BASED ALLOYS

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There is strong industrial preference for cast Nb silicide alloys, in particular for directionally solidified (DS) alloys, owing to familiarity of industry with production and use of cast Ni superalloys for more than 30 years.

Solidification processing of the new alloys can “control” their microstructures via the reactions  $L \rightarrow (Nb) + Nb_3Si$ ,  $L + \beta Nb_5Si_3 \rightarrow Nb_3Si$ ,  $Nb_3Si \rightarrow (Nb) + \alpha Nb_5Si_3$  and  $L \rightarrow (Nb) + \beta Nb_5Si_3$ , of which the former can be suppressed in favour of the latter that is metastable in the Nb-Si binary.

In the open literature the solidification processing of Nb silicide based alloys has attracted very little attention compared with their microstructures, mechanical properties and oxidation, owing to the difficulty of scaling up from small arc melted buttons and the limited availability of facilities for melting and casting ultra-high temperature alloys (most of the developmental alloys have  $T_{liquidus} > 2273$  K) and for their secondary processing. The presentation will discuss the above reactions in model Nb silicide based alloys with particular emphasis on the formation and stability of the  $Nb_3Si$  and  $\beta Nb_5Si_3$ . New data about the dependence of the formation of the  $Nb_3Si$  on solidification conditions will be presented for the first time and discussed. The experimental data will be from cast and heat treated alloys that were prepared using arc and plasma melting and optical floating zone (OFZ) melting.