

# Gd-Si (Gadolinium-Silicon)

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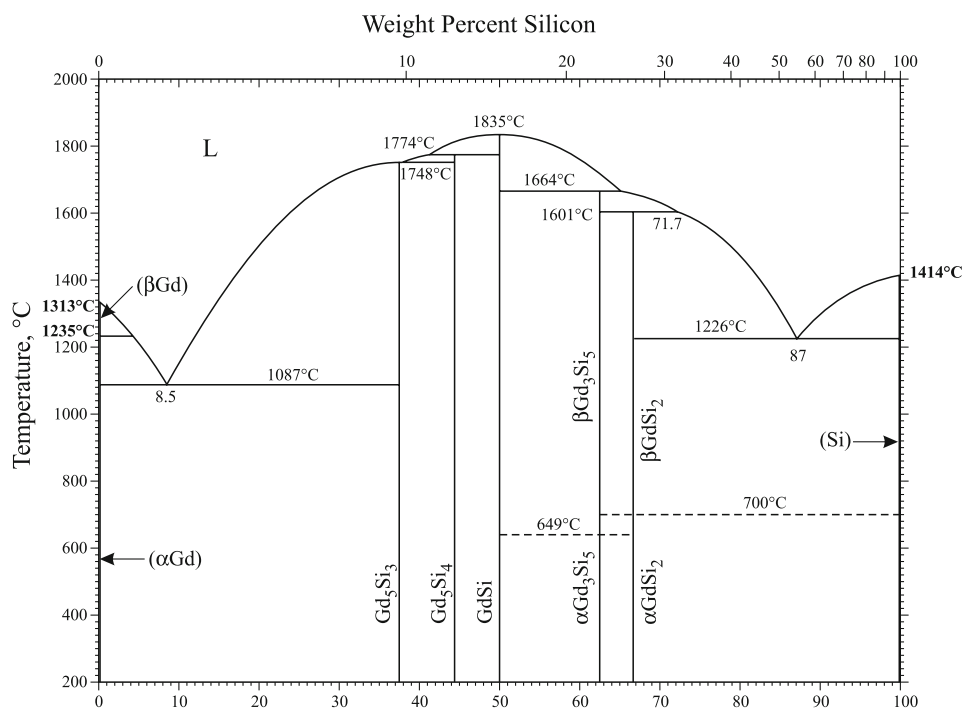
The Gd-Si phase diagram in [Massalski2] was updated by [1995Oka] according to [1991Ere]. Intermediate compounds existed in this diagram were  $Gd_5Si_3$ ,  $Gd_5Si_4$ , GdSi,  $Gd_2Si_3$  (dimorphic), and  $GdSi_2$  (dimorphic). The asymmetry and inflection in the GdSi liquidus were thought to be unlikely [1995Oka].

Figure 1 shows the Gd-Si phase diagram proposed by [2007Hua] based on experimental investigations and

thermodynamic modeling. Additional information on polymorphic transitions is shown with dashed lines. The most significant change from [1991Ere] diagram is that  $Gd_3Si_5$  exists instead of  $Gd_2Si_3$ . The problems of the asymmetry and inflection in the GdSi liquidus have been solved in this new phase diagram. According to [2007Hua],  $GdSi_2$  may have an observable width because the polymorphic transition temperatures are different on either side of this phase, as

**Table 1** Gd-Si crystal structure data

Phase	Composition, at.% Si	Pearson symbol	Space group	Strukturbericht designation	Prototype
( $\beta$ Gd)	0	<i>cI2</i>	<i>Im<math>\bar{3}m</math></i>	<i>A2</i>	W
( $\alpha$ Gd)	0	<i>hP2</i>	<i>P6<math>_3</math>/mmc</i>	<i>A3</i>	Mg
$Gd_5Si_3$	37.5	<i>hP16</i>	<i>P6<math>_3</math>/mcm</i>	<i>D8<math>_8</math></i>	$Mn_5Si_3$
$Gd_5Si_4$	44.4	<i>oP36</i>	<i>Pnma</i>	...	$Ge_4Sm_5$
GdSi	50	<i>oP8</i>	<i>Pnma</i>	<i>B27</i>	FeB
$\beta Gd_3Si_5$	62.5	<i>oI112</i>	<i>Imma</i>	...	...
$\alpha Gd_3Si_5$	62.5	<i>hP3</i>	<i>P6/mmm</i>	<i>C32</i>	$AlB_2$
$\beta GdSi_2$	66.7	<i>tI12</i>	<i>I4<math>_1</math>/amd</i>	<i>C<math>_c</math></i>	$ThSi_2$
$\alpha GdSi_2$	66.7	<i>oI12</i>	<i>Imma</i>	...	...
(Si)	100	<i>cF8</i>	<i>Fd<math>\bar{3}m</math></i>	<i>A4</i>	C (diamond)



**Fig. 1** Gd-Si phase diagram

### Section III: Supplemental Literature Review

in [1991Ere], although [1991Ere] reported the transition at much lower temperatures (500 to 425 °C).

Table 1 shows Gd-Si crystal structure data

#### References

**1991Ere:** V.N. Eremenko, K.A. Meleshevich, Yu.I. Buyanov, and P.S. Martenyuk, Phase Diagram of the Gadolinium-

Silicon System, *Ukr. Khim. Zh.*, 1991, **57**(10), p 1047-1094 in Ukrainian: TR: *Soviet Prog. Chem.*, 1991, **57**(10), p 36-42

**1995Oka:** H. Okamoto, Comment on Gd-Si (Gadolinium-Silicon), *J. Phase Equilib.*, 1995, **16**(2), p 198-199

**2007Hua:** M. Huang, D.L. Schlage, F.A. Schmidt, and T.A. Lograsso, Experimental Investigation and Thermodynamic Modeling of the Gd-Si System, *J. Alloys Compd.*, 2007, **441**, p 94-100