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Ce-Si (Cerium-Silicon)

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The Ce-Si phase diagram in [Massalski2] was redrawn from [1989Mun], which is primarily based on [1966Ben]. According to [1994Oka], this phase diagram includes a few improbable features, e.g., the liquidus of Ce_5Si_3 is too asymmetric, mixed sharpness of liquidus at the congruent melting points of intermetallic compounds is unlikely, and the two-phase field between Ce_3Si_5 and $CeSi_2$ cannot be very narrow over a wide temperature range (>1400 °C in this case).

Figure 1 is the Ce-Si phase diagram constructed by [2002Bul] by means of differential thermal analysis, x-ray diffraction, and metallography. The figure and the tempera-

Table 1 Ce-Si Crystal Structure Data

Phase	Composition, at.% Si	Pearson Symbol	Space Group	Strukturbericht Designation	Prototype
(δCe)	0	*cI*2	$Im\bar{3}m$	*A*2	W
(γCe)	0	*cF*4	$Fm\bar{3}m$	*A*1	Cu
(βCe)	0	*hP*4	$P6_3/mmc$	*A*3′	αLa
Ce_5Si_3	37.5	*tI*32	*I*4/*mcm*	$D8_m$	W_5Si_3
Ce_3Si_2	40	*tP*10	*P*4/*mbm*	$D5_a$	Si_2U_3
Ce_5Si_4	44.4	*tP*36	$P4_12_12$	…	Si_4Zr_5
CeSi	50	*oP*8	*Pnma*	*B*27	FeB
Ce_3Si_5	61.5-62.5	*oI*12	*Imma*	…	$GdSi_2$
$CeSi_2$	64-67	*tI*12	$I4_1/amd$	C_c	$ThSi_2$
(Si)	100	*cF*8	$Fd\bar{3}m$	*A*4	$C_{diamond}$

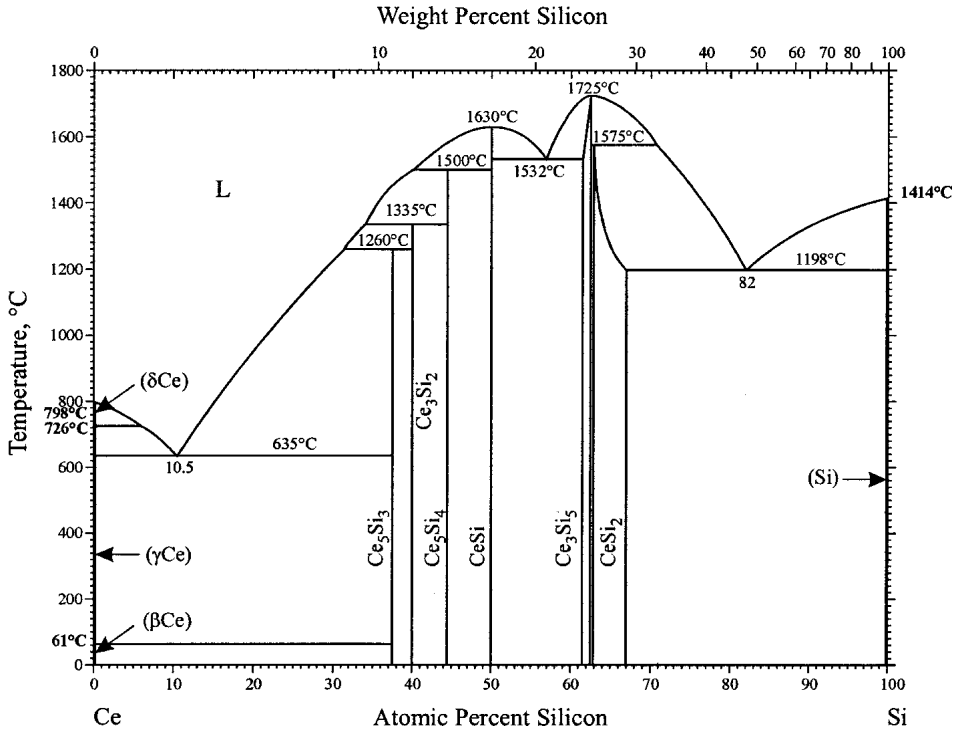

Fig. 1 Ce-Si phase diagram

ture labels in [2002Bul] disagree by as much as ~30 °C. Figure 1 has been adjusted by assuming that the labels are correct. In [2002Bul], Ce_3Si_5 and $CeSi_2$ are indicated to have ranges of homogeneity, which are separated by a very narrow two-phase field. The composition invariant boundaries on either side of the Ce, Si, and $CeSi_2$ phases drawn by [2002Bul] are thermodynamically most unlikely and merit further study. Indeed the possibility of those two phases being continuous through a second-order transition should be examined.

Table 1 shows Ce-Si crystal structure data copied from [Massalski2] with modifications made on Ce_5Si_4 according to [2002Bul].

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