

Ce-O (Cerium-Oxygen)

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The partial Ce-O phase diagram (59-68 at.% O) in [Massalski2] was redrawn from [Shunk].

A complete phase Ce-O phase diagram (Fig. 1) was constructed thermodynamically by [2006Zin] based on

experimental data reported in numerous sources. Figure 2 shows solubility of oxygen in (δ Ce) and (γ Ce). Figure 3 shows the detail of relationships among phases existing between Ce_2O_3 and CeO_2 . The possible existence of

Table 1 Ce-O crystal structure data

Phase	Composition, at.% O	Pearson symbol	Space group	Strukturbericht designation	Prototype
(δ Ce)	0-0.6	<i>cI2</i>	<i>Im</i> $\bar{3}m$	<i>A2</i>	W
(γ Ce)	0-0.5	<i>cF4</i>	<i>Fm</i> $\bar{3}m$	<i>A1</i>	Cu
γCe_2O_3	57.3-59.3	...	...	...	...
βCe_2O_3	56.9-58.6	<i>hP5</i>	<i>P</i> $\bar{3}m1$	<i>D5</i> ₂	La ₂ O ₃
αCe_2O_3	56.9-60	<i>cI80</i>	<i>Ia</i> $\bar{3}$	<i>D5</i> ₃	Mn ₂ O ₃
Ce ₇ O ₁₂	63.2	<i>hR19</i>	<i>R</i> $\bar{3}$	...	...
Ce ₃ O ₅	62.2-62.8	...	...	...	...
CeO ₂	62.2-66.7	<i>cF12</i>	<i>Fm</i> $\bar{3}m$	<i>C1</i>	CaF ₂
Ce ₉ O ₁₆	64.0	<i>hR*</i>
Ce ₁₉ O ₃₄	64.2	...	...	...	...
Ce ₅ O ₉	64.3	...	...	...	...
Ce ₃₁ O ₅₆	64.4	...	...	...	...
Ce ₁₁ O ₂₀	64.5	<i>aP31</i>	<i>P</i> $\bar{1}$	...	...

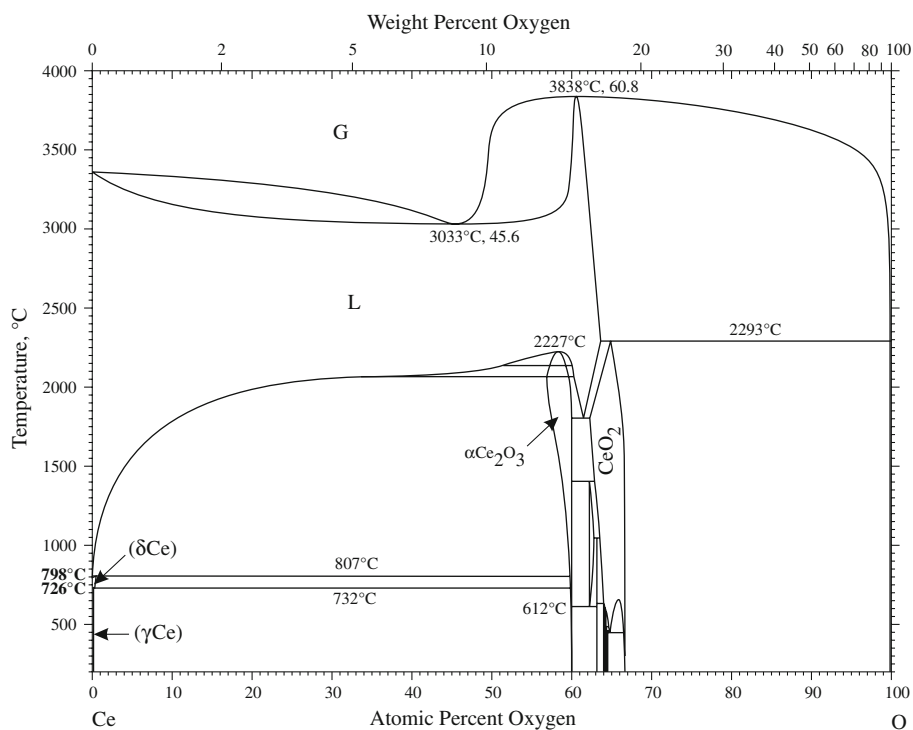


Fig. 1 Ce-O phase diagram

Section III: Supplemental Literature Review

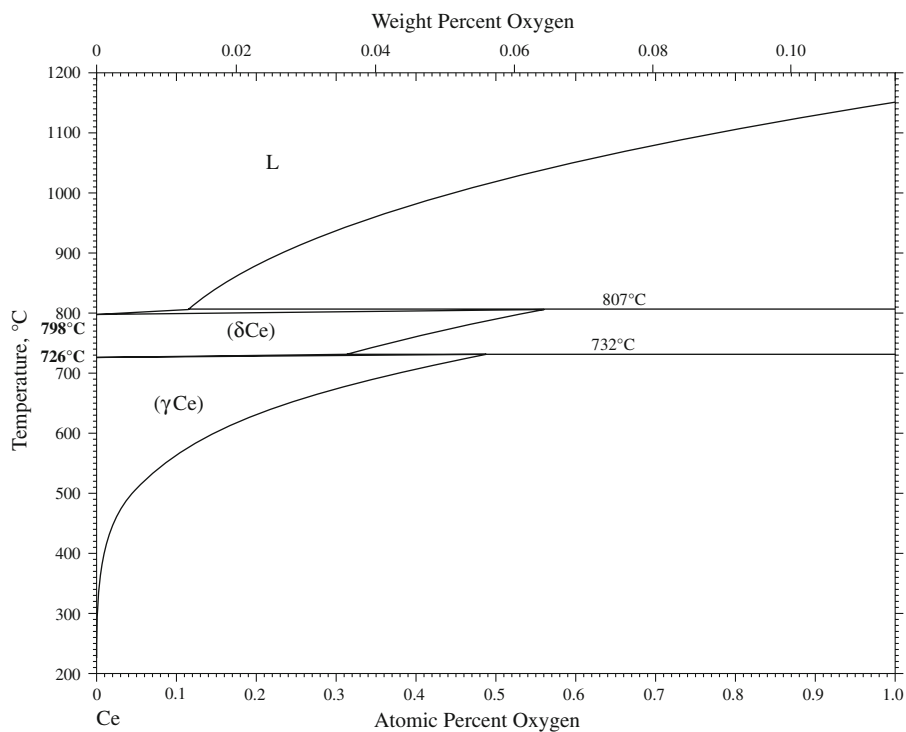


Fig. 2 Detail of Ce-O phase diagram (0-1 at.% O)

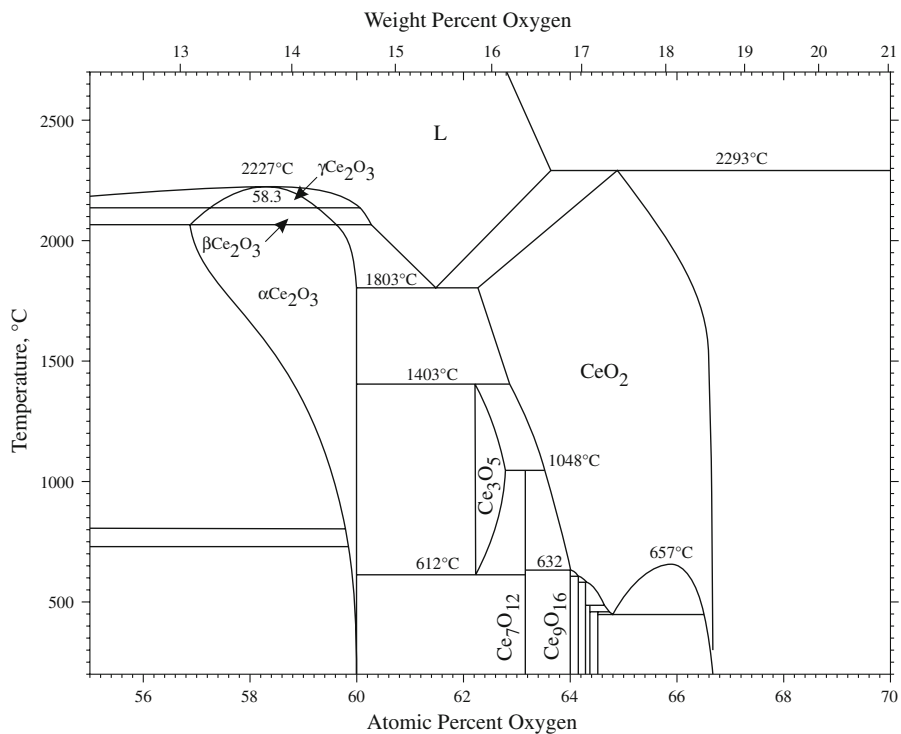


Fig. 3 Detail of Ce-O phase diagram (55-70 at.% O)

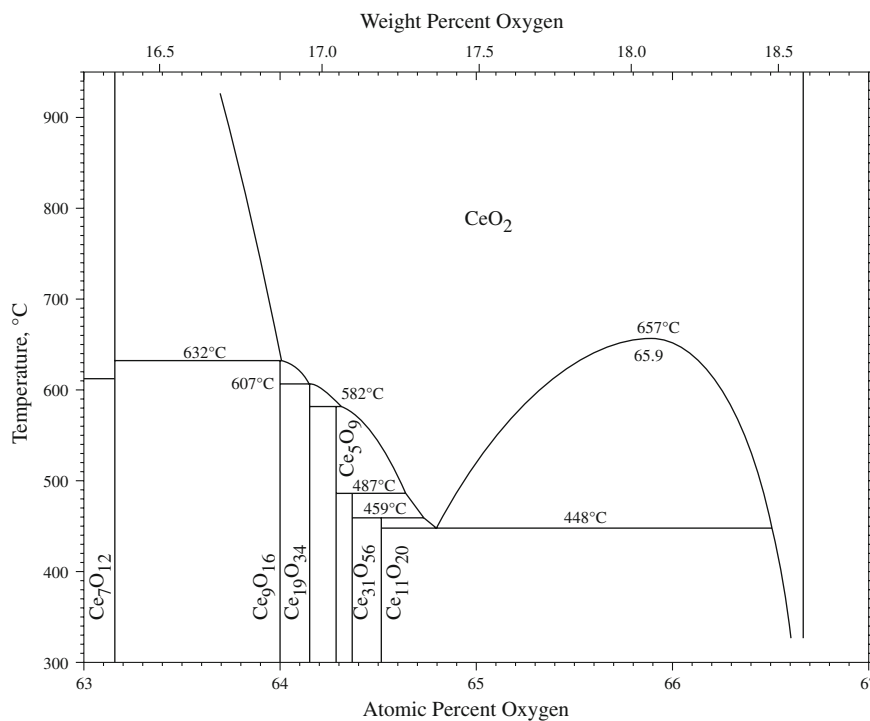


Fig. 4 Detail of Ce-O phase diagram (63-67 at.% O)

many intermediate phases around CeO_2 was reported in [Massalski2]. These phases have been clarified by [2006Zin], as shown in Fig. 4.

Table 1 shows Ce-O crystal structure data.

Reference

2006Zin: M. Zinkevich, D. Djurovic, and F. Aldinger, Thermodynamic Modelling of the Cerium-Oxygen System, *Solid State Ionics*, 2006, **177**, p 989-1001