

C-W (Carbon-Tungsten)

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The tungsten-carbon phase diagram in [Massalski2] was adopted from [1965Sar] and [1967Rud]. [1991Nag] later assessed the W-C system and proposed a new phase diagram. The overall features were similar to those of [Massalski2], but phase transitions among W_2C polymorphs were shown with uncertainty.

[2006Kur] investigated crystal structures of various tungsten-carbon compounds and proposed a phase diagram based on the results, as shown in Fig. 1. Phase transitions in the W_2C phases are based on the same data as [Massalski2].

Therefore the phase diagrams of [2006Kur] and [Massalski2] are similar in this region.

For the WC phases, [Massalski2] and [1991Nag] showed only one phase, whereas [2006Kur] showed that WC is polymorphic. The high-temperature βWC phase field in Fig. 1 has been redrawn from [2006Kur] with a minor modification for consistency with the phase rule. The phase in [Massalski2] or [1991Nag] corresponding to βWC is observed around the W-rich end of βWC field in Fig. 1 and extends up to only about 40 at.% C. Therefore, this phase

Table 1 W-C crystal structure data

Phase	Composition, at.% C	Pearson symbol	Space group	Strukturbericht designation	Prototype
(W)	0-1	<i>cI2</i>	<i>Im$\bar{3}m$</i>	<i>A2</i>	W
γW_2C	25.5-34	<i>hP3</i>	<i>P6_3/mmc</i>	<i>L'3</i>	Fe_2N
βW_2C	29.5-33	<i>oP12</i>	<i>Pbcn</i>
αW_2C	29.5-32.5	<i>hP3</i>	<i>P$\bar{3}m1$</i>	<i>C6</i>	CdI_2
βWC	37.1-50	<i>cF8</i>	<i>Fm$\bar{3}m$</i>	<i>B1</i>	NaCl
αWC	49-50	<i>hP2</i>	<i>P6m2</i>	<i>B_h</i>	WC
(C) (a)	100	<i>hP4</i>	<i>P6_3/mmc</i>	<i>A9</i>	C (graphite)

(a) Not shown in Fig. 1

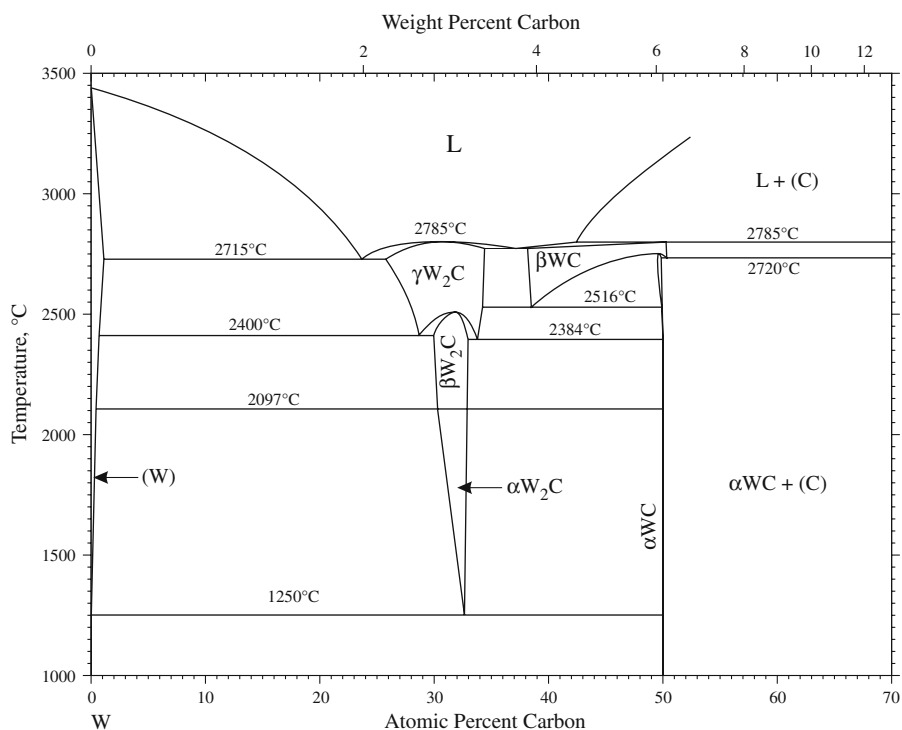


Fig. 1 W-C phase diagram

Section III: Supplemental Literature Review

was named differently, i.e., γ [Massalski2] or WC_{1-x} [1991Nag].

Table 1 shows W-C crystal structure data adopted from [2006Kur].

References

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- 1967Rud:** E. Rudy and J.R. Hoffmann, Phase Equilibria in the Cubic Carbide Phase of the System W-C, *Planseeber. Pulvermetall.*, 1967, **15**, p 174-178, in German
- 1991Nag:** S.V. Nagender Naidu, A.M. Sriramamurthy, and P. Rama Rao, C-W (Carbon-Tungsten), *Phase Diagrams of Binary Tungsten Alloys*, S.V. Nagender Naidu and P. Rama Rao, Ed., Indian Institute of Metals, Calcutta, India, 1991, p 37-50
- 2006Kur:** A.S. Kurlov and A.I. Gusev, Tungsten Carbides and W-C Phase Diagram, *Inorg. Mater.*, 2006, **42**(2), p 121-127