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Cr-Pt (Chromium-Platinum)

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The Cr-Pt phase diagram in [Massalski2] was redrawn from [1990Ven]. In this phase diagram, the melting behavior of Cr_3Pt (shown as Cr_4Pt in Fig. 1) violated Gibbs-Konovalov rule and the phase boundaries of the low-temperature ordered phases were ambiguous. Therefore, some improvement was apparently needed.

The problem of the Gibbs-Konovalov rule violation was solved in the phase diagram calculated by [2001Oik]. The phase boundaries of the low-temperature ordered phases, Cr_3Pt, CrPt, and $CrPt_3$, were determined by thermodynamic modeling by [2008Zha], as shown in Fig. 1. The $L1_2$-type Cr_3Pt phase has the peak at about 1250 °C and 25 at.% Pt in the metastable state. The peak is hidden due to the existence of a more stable phase Cr_4Pt.

The phase Cr_4Pt in Fig. 1 may need further clarification. Because the composition of its congruent melting point is 19.1 at.% Pt and the composition of the melting point cannot be far away from the stoichiometric composition, Cr_4Pt designation seems to be appropriate from the standpoint of the location of the phase in the phase diagram. However, it has been well established that the phase has the Cr_3Si-type crystal structure [1991Vil]. In this regard, Cr_3Pt may be a better designation for this phase. Nevertheless, "Cr_4Pt" is used in Fig. 1 in order to differentiate it from the $L1_2$-type Cr_3Pt.

Table 1 Cr-Pt crystal structure data

Phase	Composition, at.% Pt	Pearson symbol	Space group	Strukturbericht designation	Prototype
(Cr)	0-6.8	*cI*2	$Im\bar{3}m$	*A*2	W
Cr_4Pt	17.3-25	*cP*8	$Pm\bar{3}n$	*A*15	Cr_3Si
Cr_3Pt	34-41	*cP*4	$Pm\bar{3}n$	$L1_2$	$AuCu_3$
CrPt	42-58	*tP*4	*P*4/*mmm*	$L1_0$	AuCu
$CrPt_3$	60-80	*cP*4	$Pm\bar{3}m$	$L1_2$	$AuCu_3$
(Pt)	31.3-100	*cF*4	$Fm\bar{3}m$	*A*1	Cu

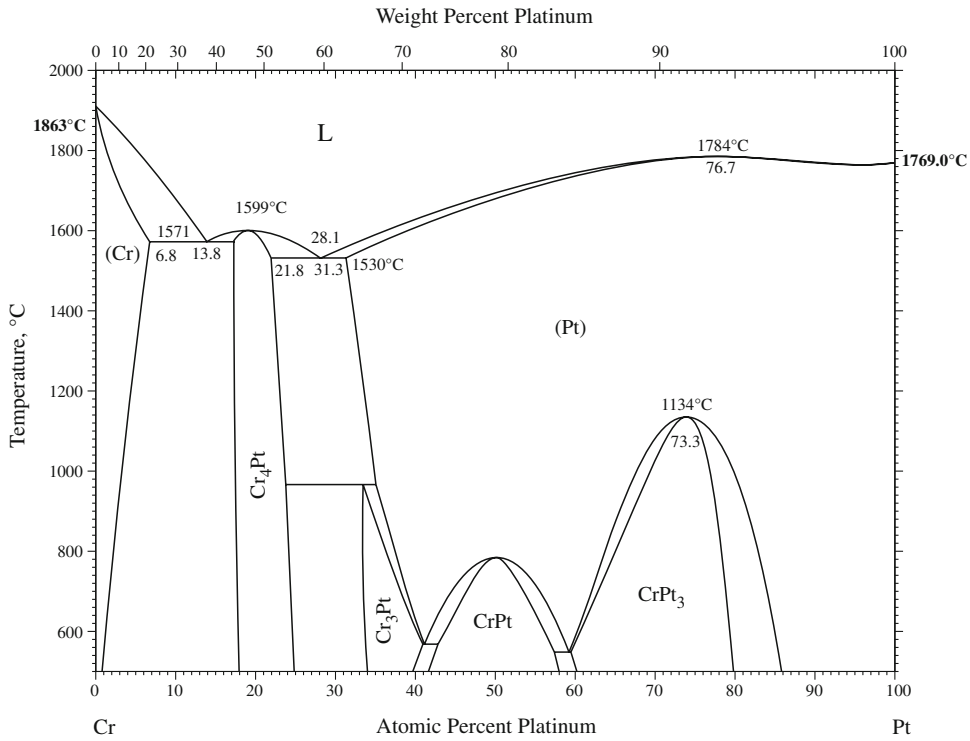

Fig. 1 Cr-Pt phase diagram

Table 1 shows Cr-Pt crystal structure data. The composition range is for the phase diagram shown in Fig. 1. The actual maximum range may be much broader particularly for CrPt.

References

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