

# Al-Cr (Aluminum-Chromium)

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The Al-Cr phase diagram in [Massalski2] was assessed by [1998Mur].

Figure 1 shows the updated Al-Cr phase diagram. The [1998Mur] phase diagram and Fig. 1 differ in the following features.

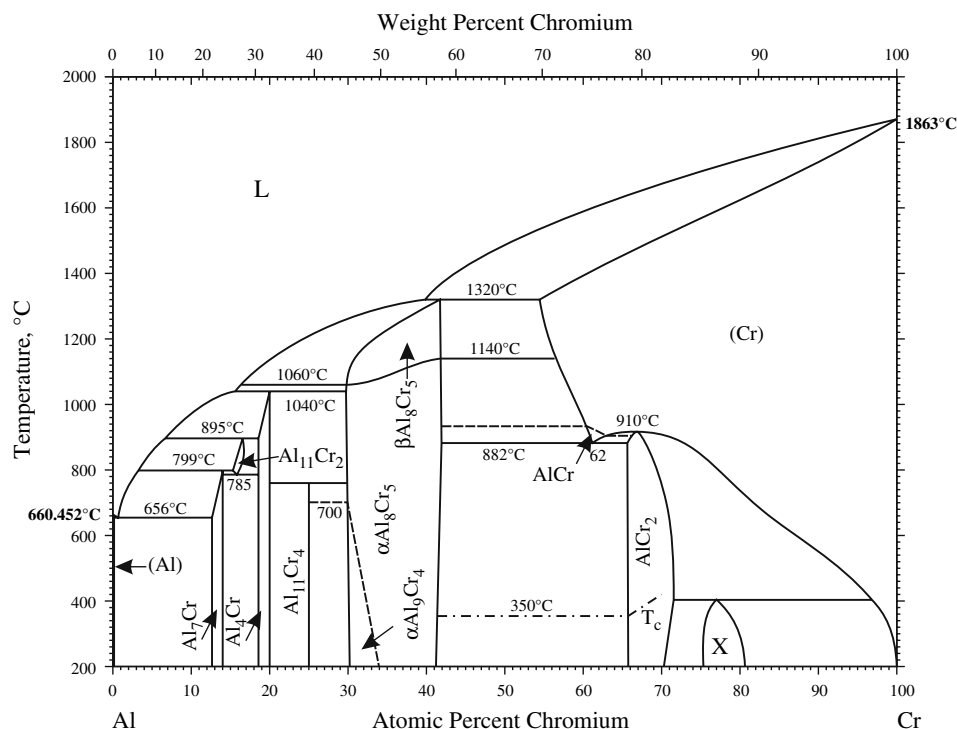
- $\text{Al}_{11}\text{Cr}_2$ : According to [1998Mur],  $\text{Al}_{11}\text{Cr}_2$  is stable at least down to 200 °C. [2000Mah] found that  $\text{Al}_{11}\text{Cr}_2$  decomposes eutectoidally at 785 °C.
- $\text{Al}_{11}\text{Cr}_4$ : [2006Gru] discovered  $\text{Al}_{11}\text{Cr}_4$  at about  $\text{Al}_3\text{Cr}$  composition. It forms from  $\text{Al}_4\text{Cr}$  and  $\alpha\text{Al}_8\text{Cr}_5$  by a peritectoid reaction at a temperature between 700 and 800 °C.
- $\text{Al}_8\text{Cr}_5$ : According to [1998Mur],  $\gamma\text{Al}_9\text{Cr}_4$ ,  $\beta\text{Al}_9\text{Cr}_4$ ,  $\alpha\text{Al}_9\text{Cr}_4$ ,  $\beta\text{Al}_8\text{Cr}_5$ , and  $\alpha\text{Al}_8\text{Cr}_5$  exist in the range covered by  $\alpha\text{Al}_9\text{Cr}_4$ ,  $\beta\text{Al}_8\text{Cr}_5$ , and  $\alpha\text{Al}_8\text{Cr}_5$  in Fig. 1. [2000Mah] could not find any phase separation between  $\text{Al}_9\text{Cr}_4$  and  $\text{Al}_8\text{Cr}_5$  and questioned the phase relation shown in [Massalski2]. In agreement with [2000Mah], [2005Gru] found only  $\beta\text{Al}_8\text{Cr}_5$  and  $\alpha\text{Al}_8\text{Cr}_5$  in this range (22-55 at.% Cr). The result of [2005Gru] is shown in Fig. 1. The existence of  $\alpha\text{Al}_9\text{Cr}_4$  was not examined by [2005Gru]. Therefore, it is still shown in Fig. 1 in the same way as in [Massalski2]. Its existence must be reexamined.

- AlCr: The existence of the second-order transition from bcc (Cr) to CsCl-type AlCr was found by [1999Hel].

Table 1 shows Al-Cr crystal structure data. Two other phases,  $\text{Al}_{13}\text{Cr}_2$  and  $\text{Al}_5\text{Cr}$ , reported earlier are the same

**Table 1** Al-Cr crystal structure data

Phase	Composition, at.% Cr	Pearson symbol	Space group	Strukturbericht designation	Prototype
(Al)	0	<i>cF4</i>	<i>Fm</i> $\bar{3}$ <i>m</i>	<i>A1</i>	Cu
$\text{Al}_7\text{Cr}$	12.5-14	<i>mC104</i>	<i>C2/m</i>	...	$\text{Al}_{45}\text{V}_7$
$\text{Al}_{11}\text{Cr}_2$	15.2-17	<i>mP48</i>	<i>P2</i>	...	...
$\text{Al}_4\text{Cr}$	18.5-20	<i>mP180</i>	<i>P2/m</i>	...	...
$\text{Al}_{11}\text{Cr}_4$	25	<i>aP30</i>	<i>P</i> $\bar{1}$	...	...
$\alpha\text{Al}_9\text{Cr}_4$	30-34	<i>cI52</i>	<i>I</i> $\bar{4}3m$	...	...
$\beta\text{Al}_8\text{Cr}_5$	30-42	...	...	...	...
$\alpha\text{Al}_8\text{Cr}_5$	30-42	<i>hR26</i>	<i>R</i> $\bar{3}m$	<i>D8</i> <sub>10</sub>	$\text{Al}_8\text{Cr}_5$
AlCr	60.5-63	<i>cP2</i>	<i>Pm</i> $\bar{3}m$	<i>B2</i>	CsCl
$\text{AlCr}_2$	65.5-71.4	<i>tI6</i>	<i>I4/mmm</i>	<i>C11</i> <sub>b</sub>	$\text{MoSi}_2$
X	~75	...	...	...	...
(Cr)	54.5-100	<i>cI2</i>	<i>Im</i> $\bar{3}m$	<i>A2</i>	W



**Fig. 1** Al-Cr phase diagram

phases as  $\text{Al}_7\text{Cr}$  and  $\text{Al}_{11}\text{Cr}_2$ , respectively, according to [1998Mur].

### References

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- 1999Hel:** T. Helander and O. Tolochko, An Experimental Investigation of Possible B2-Ordering in the Al-Cr System, *J. Phase Equilibria*, 1999, **20**(1), p 57-60
- 2000Mah:** K. Mahdouk and J.C. Gachon, Thermodynamic Investigation of the Aluminum-Chromium System, *J. Phase Equilibria*, 2000, **21**(2), p 157-166
- 2005Gru:** B. Grushko, E. Kowalska-Strzęciwilk, B. Przepiórzyński, and M. Surowiec, Investigation of the Al-Cr  $\gamma$ -range, *J. Alloys Compd.*, 2005, **402**, p 98-104
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