# Al-Mn (Aluminum-Manganese)

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The Al-Mn phase diagram in [Massalski2] (solid lines in Fig. 1) was redrawn from [87Mca]. A calculated Al-Mn phase diagram was reported by [92Jan]. However, this diagram does not reflect the phase relationship that $\gamma$ and ($\delta$Mn) are the same phase [94Oka]. In addition, $\gamma$ and $\gamma_2$ were not differentiated.

Figure 1 shows experimental Al-Mn phase diagrams independently reported by [96Liu] (50 to 80 at.% Mn, 800 to 1200 °C) and [96Mul] (45 to 65 at.% Mn, >600 °C) also. [96Liu] used diffusion couple techniques, optical metallography, XRD, and DSC to determine primarily boundaries among ($\delta$Mn), ($\beta$Mn), $\varepsilon$ and $\gamma$ phases, whereas [96Mul] used DTA to determine primarily boundaries of the L + $\varepsilon$ two-phase field, $\varepsilon \leftrightarrow \gamma$ + ($\beta$Mn) eutectoid, and $\gamma \leftrightarrow \gamma_2$ + ($\beta$Mn) eutectoid. The results of [96Liu] and [96Mul] cannot be compromised, particularly along the ($\delta$Mn) + $\varepsilon$ boundaries. Therefore, a further investigation is needed.

Table 1 reproduces Al-Mn crystal structure data reported in [94Oka] with phase identifications adjusted to the current phase diagram. $\gamma_2$ is often referred to as $Al_8Mn_5$ for its $Al_8Cr_5$-type structure. [94Oka] questioned the existence of $\lambda$ for its proximity to $\mu$.

## Cited References


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**Table 1 Al-Mn Crystal Structure Data**

| Phase | Composition, at.% Mn(a) | Pearson symbol | Space group | Strukturbericht designation | Prototype | Reference |
|---|---|---|---|---|---|---|
| (Al) | 0 to 0.62 | *cF*4 | $Fm\bar{3}m$ | *A*1 | Cu | ... |
| $Al_{12}Mn$(b) | 7.7 | *cI*27 | $Im\bar{3}$ | ... | $Al_{12}W$ | [75Bar] |
| $Al_6Mn$ | 14.2 | *oC*28 | *Cmcm* | $D2_h$ | $Al_6Mn$ | [38Hof] |
| $\lambda$ | ? | *oP*60 | *Pnnn* | ... | ... | [75Oni] |
| $\mu$($Al_4Mn$) | 19 to 20.8 | *hP*574 | $P6_3/mmc$ | ... | ... | [89Sho] |
| $Al_{11}Mn_4$(HT) | 27 | *oP*160 | *Pnma* | ... | ... | [61Tay] |
| $Al_{11}Mn_4$(LT) | 25 to 28.7 | *aP*30 | $P\bar{1}$ | ... | ... | [58Bla] |
| $\gamma_1$ | 30 to 38.2 | ... | ... | ... | ... | ... |
| $\gamma_2$($Al_8Mn_5$) | 31.4 to 47 | *hR*26 | $R\bar{3}m$ | $D8_{10}$ | $Al_8Cr_5$ | [60Sch] |
| $\gamma$ | 34.5 to 51.3 | *cI*2 | $Im\bar{3}m$ | *A*2 | W | [30Wes] |
| $\varepsilon$ | 53.2 to 60 | *hP*2 | $P6_3/mmc$ | *A*3 | Mg | [58Kon] |
| ($\alpha$Mn) | 98 to 100 | *cI*58 | $I\bar{4}3m$ | *A*12 | $\alpha$Mn | ... |
| ($\beta$Mn) | 59.5 to 100 | *cP*20 | $P4_132$ | *A*13 | $\beta$Mn | ... |
| ($\gamma$Mn) | 90.9 to 100 | *cF*4 | $Fm\bar{3}m$ | *A*1 | Cu | ... |
| ($\delta$Mn) | 61.5 to 100 | *cI*2 | $Im\bar{3}m$ | *A*2 | W | ... |

**Note:** HT, high temperature. LT, low temperature. **(a)** For [Massalski2]. **(b)** Not in Fig. 1.

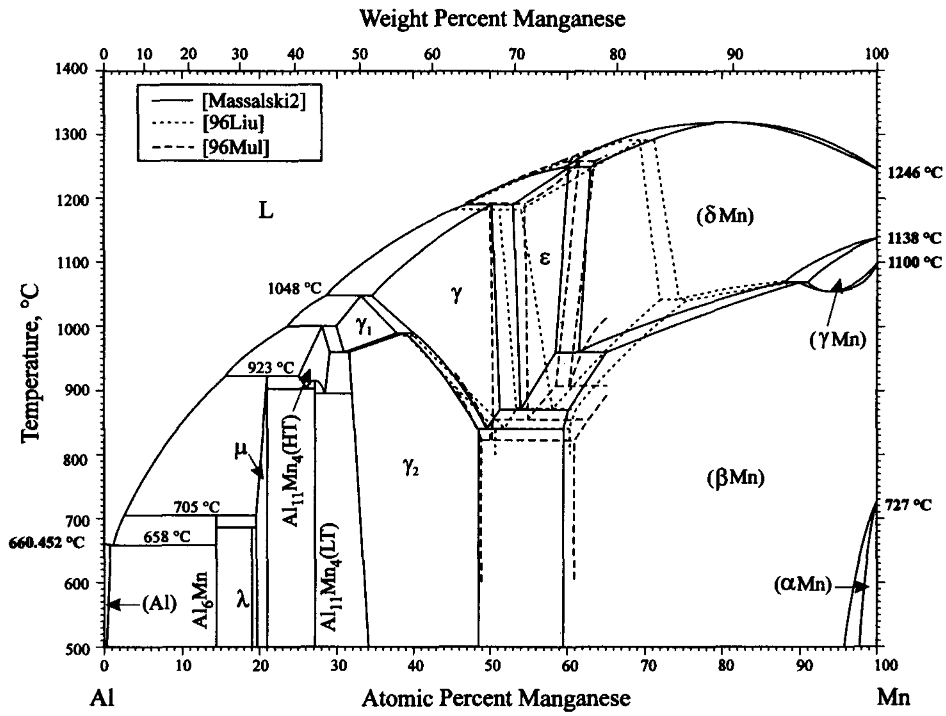


Fig. 1 The Al-Mn phase diagram.