

Al-Cr-Fe (Aluminum-Chromium-Iron)

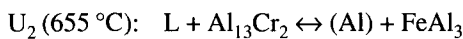
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[88Ray] reviewed the experimental data on this system and presented the reviewed results as: (1) a liquidus projection for alloys near the Al-corner; (2) liquidus and solidus projections for the other regions; (3) isothermal sections for alloys with less than 50 wt.% Al at 1150, 900, 750, 700, 650, and 600 °C; (4) an isothermal section at 600 °C near the Al-corner; (5) a partial reaction sequence; and (6) vertical sections depicting the ordering reactions in Fe₃Al as a function of Cr content.

Update

[84Tav] found that the σ phase formation in Fe-Cr alloys is suppressed by the addition of 1 to 1.5 wt.% Al. [88Hoc] described the stable binary compounds of this system by combining the Hoch-Arpshofen and Schottky-Wagner models. [89Aku] calculated the activities and excess free energies of Al and Cr in the ternary alloys. [91Tre] reported a vertical section along the Cr-FeAl line.

[87Sau] computed the liquidus surface near the Al-corner employing the assessed thermodynamic data of the binary systems. The computed liquidus surface is redrawn in Fig. 1. The ternary invariant reactions in the computed results differ from those in the reviewed data of [88Ray]. The computed reactions are:



The calculated compositions of the invariant liquids are: for U₁, 1.52 at.% Fe (3.09 wt.% Fe) and 0.32 at.% (0.61 wt.% Cr), and for U₂, 0.98 at.% (2.02 wt.% Fe) and 0.09 at.% (0.19 wt.% Cr).

Cited References

- 84Tav:** F.N. Tavazde, D.D. Ebanoidze, and Z.M. Gilauri, "Effect of Al on the Formation of the Sigma Phase in Fe-Cr Alloys," *Sobosh. Akad. Nauk Gruz. SSR*, 114(1), 113-116 (1984) in Russian. (Experimental)
- 87Sau:** N. Saunders and V.G. Rivlin, "A Critical Review and Thermodynamic Calculations for the Al-Rich Portion of the Al-Cr-Fe Phase Diagram," *Z. Metallkd.*, 78,(11), 795-801 (1987). (Review; #)
- 88Hoc:** M. Hoch, "Thermodynamic Behaviour of Very Stable Solid Binary Compounds with a Wide Homogeneity Range: Their Influence in the Liquid Phase and in Ternary and Higher Component Systems in the Solid State," *Z. Metallkd.*, 79(7), 426-434 (1988). (Thermo; Review)
- 88Ray:** G.V. Raynor and V.G. Rivlin, "Al-Cr-Fe," *Phase Equilibria in Iron Ternary Alloys*, Institute of Metals, London, 81-97 (1988). (Review; #)
- 89Aku:** H.C. Akuezie and J. Stringer, "Interdiffusion in Ternary Fe-Cr-Al Alloys," *Metall. Trans. A*, 20(12), 2767-2781 (1989). (Experimental; Review)
- 91Tre:** L.A. Tretyachenko, S.B. Prima, and V.N. Petyukh, "Polythermal Cr-FeAl Section of the Cr-Fe-Al Phase Diagram," *Diagrammy Sostoyaniya v Materialoved. AN USSR, Int. Prob. Materialoved. Nauch. Sov. AN SSSR po Probl. "Khim. Termodinam. i Term. Anal."*, Kiev, 143-146 (1991) in Russian. (Experimental; #)

#Indicates presence of a phase diagram.

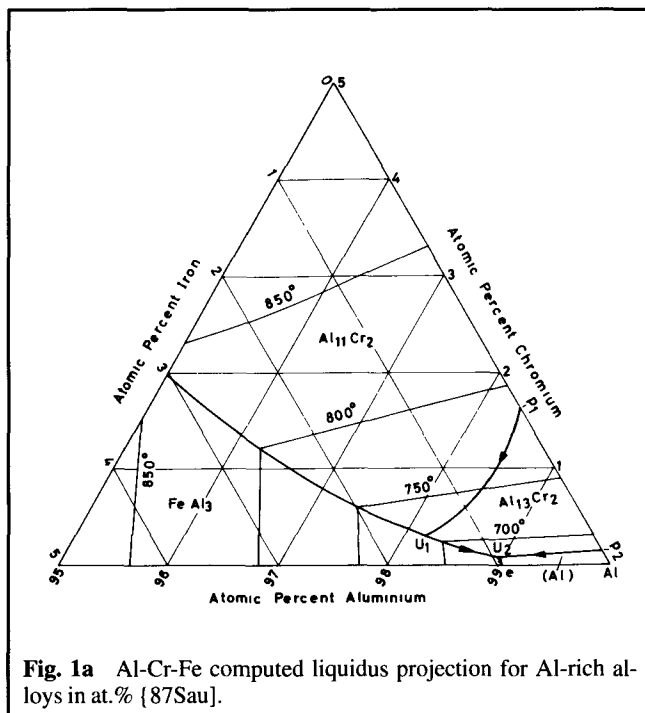


Fig. 1a Al-Cr-Fe computed liquidus projection for Al-rich alloys in at.% [87Sau].

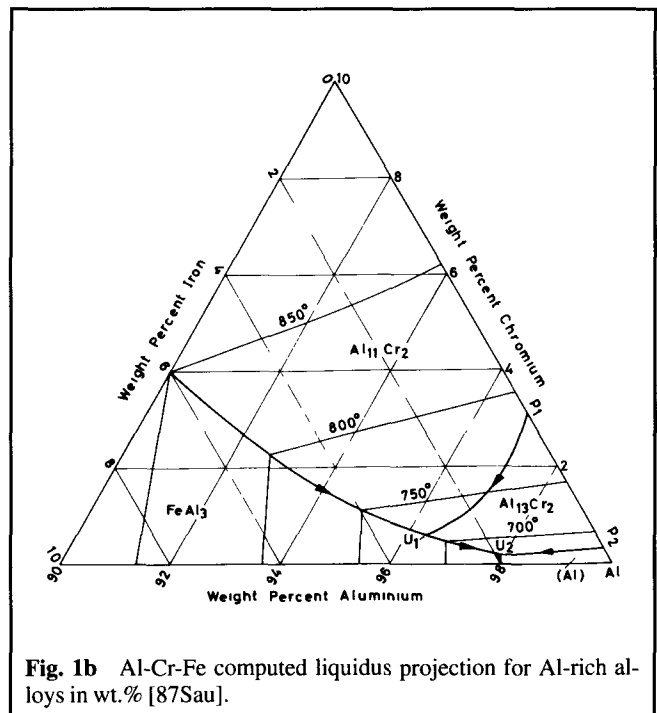


Fig. 1b Al-Cr-Fe computed liquidus projection for Al-rich alloys in wt.% [87Sau].