

Al-Mg-Sc (Aluminum-Magnesium-Scandium)

V. Raghavan

Ternary alloys having a four-phase monotectic reaction can possess interesting properties, with two different solidified liquids in the microstructure. [1999Gro] and [2005Gro] computed a liquidus surface of this ternary system. The other results of [1999Gro] on isothermal and vertical sections were reviewed by [2007Rag].

Binary Systems

The Al-Mg phase diagram has the following intermediate phases: Mg_2Al_3 (cubic, labeled β), R or ϵ (rhombohedral), and $Mg_{17}Al_{12}$ ($A12$, α Mn-type cubic, denoted γ). The Al-Sc phase diagram depicts the following intermediate compounds: $ScAl_3$ ($L1_2$, AuCu₃-type cubic), $ScAl_2$ ($C15$, MgCu₂-type cubic), $ScAl$ ($B2$, CsCl-type cubic), and Sc_2Al ($B8_2$, Ni₂In-type hexagonal). The Mg-Sc phase diagram has one intermediate phase $MgSc$ ($B2$, CsCl-type cubic). See [Massalski2] for the above phase diagrams.

Liquidus Projection

In their thermodynamic calculation, [1999Gro] employed the binary interaction parameters from the pub-

lished literature. In addition, the ternary solubility of Mg in $ScAl_3$, $ScAl_2$ and $ScAl$ was taken into account. There are no stable or metastable liquid miscibility gaps in the three binary systems. Yet, a miscibility gap occurs within the ternary region, Fig. 1. It is characterized by the presence of two four-phase ternary monotectic reactions M_1 and M_2 . At M_1 , the solid phases in equilibrium with the two liquids are $ScAl_2$ and $ScAl$. At M_2 , they are $ScAl$ and Sc_2Al .

References

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- 2005Gro: J. Grobner and R. Schmid-Fetzer, Phase Transformations in Ternary Monotectic Aluminum Alloys, *JOM*, 2005, **57**(9), p 19-23
- 2007Rag: V. Raghavan, Al-Mg-Sc (Aluminum-Magnesium-Scandium), *J. Phase Equilib. Diffus.*, 2007, **28**(5), p 471-472

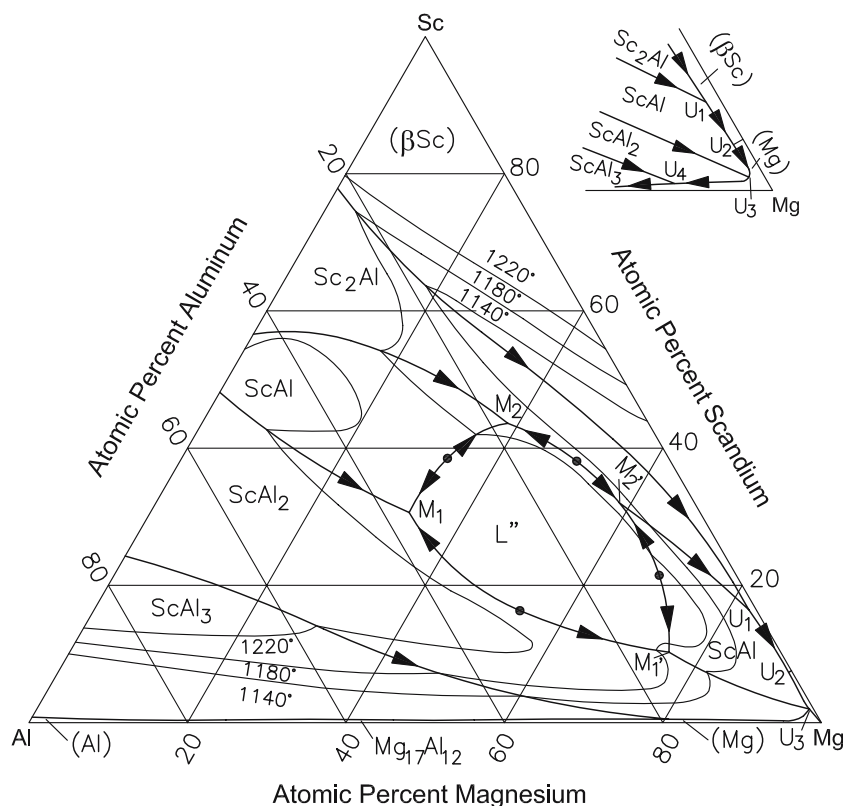


Fig. 1 Al-Mg-Sc computed liquidus projection. A schematic enlarged view of the Mg corner is shown [1999Gro]