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Al-Mg-Sm (Aluminum-Magnesium-Samarium)

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The previous study of this system by [1987Zhe] presented an isothermal section at 400 °C, which depicts no ternary compounds. Recently, [2008Jia] carried out a thermodynamic assessment of this system and computed the isothermal section at 400 °C and a tentative liquidus projection.

Binary Systems

The Al-Mg phase diagram [1998Lia] has the following intermediate phases: Mg_2Al_3 (cubic, labeled β), R or ε (rhombohedral), and $Mg_{17}Al_{12}$ (*A*12, αMn-type cubic, denoted γ). The Al-Sm system [1989Gsc, 2007Del] depicts the following intermediate phases: Sm_3Al_{11} (*D*1$_3$, Al-deficient Al_4Ba-type tetragonal), $SmAl_3$ (*D*0$_{19}$, Ni_3Sn-type hexagonal), $SmAl_2$ (*C*15, $MgCu_2$-type cubic), SmAl (ErAl-type orthorhombic) and Sm_2Al (*C*23, Co_2Si-type orthorhombic). The Mg-Sm phase diagram [Massalski2] depicts the following compounds: $Mg_{41}Sm_5$ (tetragonal), Mg_5Sm (cubic), Mg_3Sm (*D*0$_3$, BiF_3-type cubic), Mg_2Sm (*C*15, $MgCu_2$-type cubic), and MgSm (*B*2, CsCl-type cubic). The computed phase diagrams of the above binaries were given by [2008Jia].

Computed Ternary Phase Equilibria

The optimized binary interaction parameters of the Al-Sm and Mg-Sm systems were listed by [2008Jia] along with those adopted from the literature. As there are no ternary compounds in this system, [2008Jia] calculated the ternary phase equilibria by extrapolation of the binary data without introducing any ternary interaction parameters. The computed isothermal section at 400 °C shown in Fig. 1 was found to agree well with that determined by [1987Zhe]. The liquidus projection computed by [2008Jia] is shown in Fig. 2. In the binary Al-Sm phase diagram updated by [2007Del], there is only one modification of Sm_3Al_{11} (Al-deficient Al_4Ba-type). Accordingly, the ternary peritectic reaction P_2: L + $SmAl_3$ + Sm_3Al_{11}(HT) → Sm_3Al_{11}(LT) computed by [2008Jia] is omitted in Fig. 2. The reactions close to the Al-Mg side are shown schematically in the lower part of Fig. 2. An enlarged view of the Mg corner is

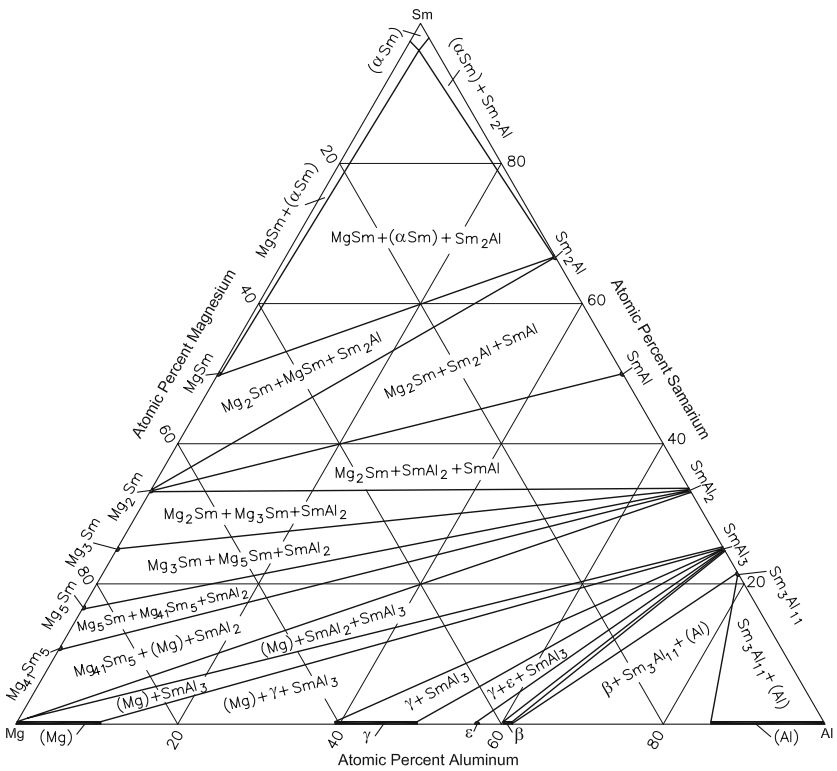

Fig. 1 Al-Mg-Sm computed isothermal section at 400 °C [2008Jia]

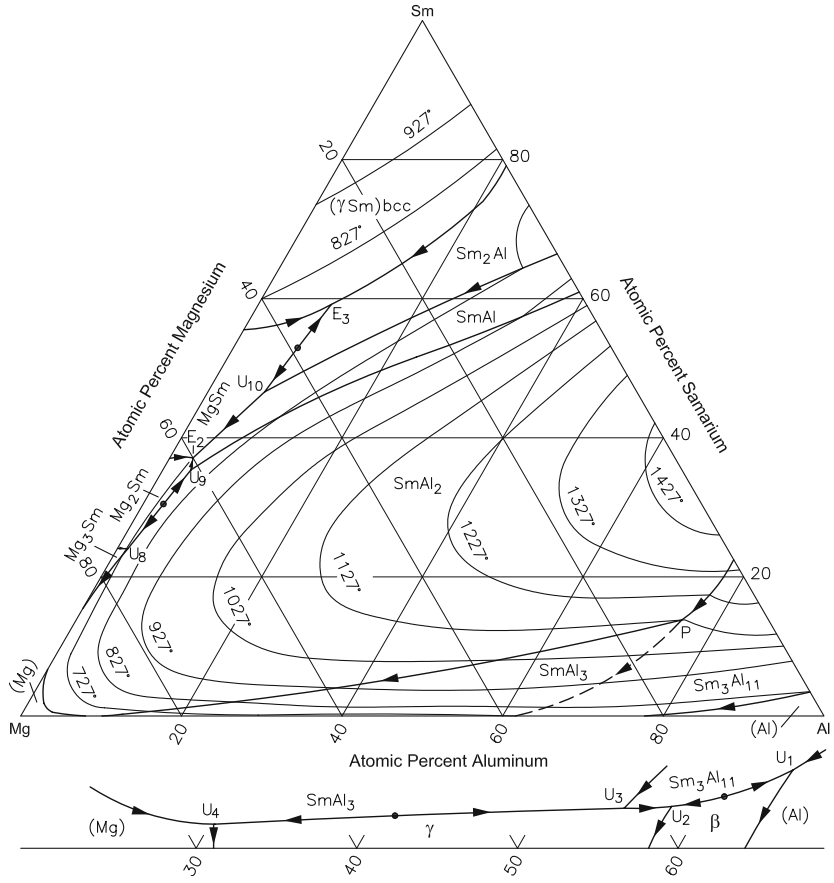

Fig. 2 Al-Mg-Sm computed liquidus projection [2008Jia]

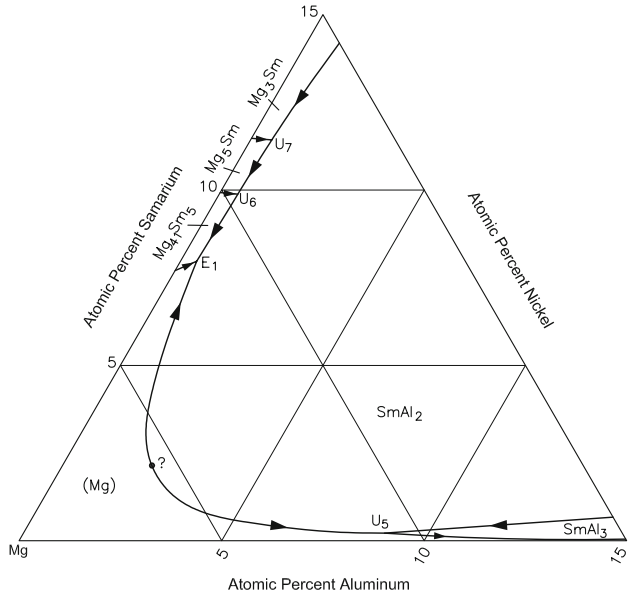

Fig. 3 Al-Mg-Sm computed liquidus projection near the Mg corner [2008Jia]

shown in Fig. 3. The liquidus projection may be considered tentative, as there are no experimental data for comparison.

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