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Al-La-Y (Aluminum-Lanthanum-Yttrium)

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An isothermal section at 500 °C for Al-rich alloys of this system was determined recently by [2004Zan].

Binary Systems

The Al-La phase diagram [2000Oka] has the following intermediate phases: La_3Al ($D0_{19}$, Ni_3Sn-type hexagonal), LaAl (CeAl-type orthorhombic), $LaAl_2$ ($C15$, $MgCu_2$-type cubic), $LaAl_x$ ($C32$, AlB_2-type hexagonal), $LaAl_3$ ($D0_{19}$, Ni_3Sn-type hexagonal), αLa_3Al_{11} (orthorhombic), and βLa_3Al_{11} ($D1_3$, Al_4Ba-type tetragonal). The Al-Y phase diagram [Massalski2] depicts the following compounds: βYAl_3 ($BaPb_3$-type rhombohedral), αYAl_3 ($D0_{19}$, Ni_3Sn-type hexagonal), YAl_2 ($C15$, $MgCu_2$-type cubic), YAl (B_f, CrB-type orthorhombic), Y_3Al_2 (Zr_3Al_2-type tetragonal), and Y_2Al ($C23$, Co_2Si-type orthorhombic). In the La-Y system [Massalski2], γLa and βY form a continuous body-centered cubic (bcc) solid solution. An intermediate phase denoted δ ($C19$, αSm-type rhombohedral) forms congruently at 735 °C and ~50 at.% Y from the solid solution between αLa and αY.

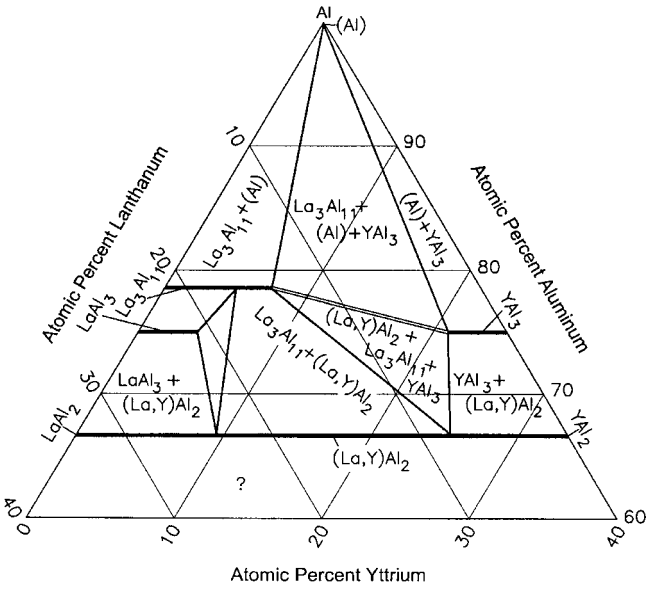

Fig. 1 Al-La-Y partial isothermal section for Al-rich alloys at 500 °C [2004Zan]

Ternary Isothermal Section

With starting metals of Al (99.999 wt.%), La (99.9 wt.%), and Y (99.9 wt.%), [2004Zan] induction-melted or arc-melted about 35 ternary alloys. The samples were annealed at 500 °C for 1 month and quenched in water. The phase equilibria were studied by optical and scanning electron microscopy, electron probe microanalysis and x-ray powder diffraction. The isothermal section at 500 °C constructed by [2004Zan] is redrawn in Fig. 1. $LaAl_2$ and YAl_2 form a continuous $C15$-type cubic solid solution, as reported earlier by [1985Ian]. The lattice parameter of this phase varies approximately linearly from 0.8148 nm at $LaAl_2$ to 0.7855 nm at YAl_2 [2004Zan]. αLa_3Al_{11} and $LaAl_3$ dissolve 7.3 and 4 at.% Y, respectively, at constant Al content. YAl_3 dissolves 4 at.% La.

References

1985Ian: A. Iandelli and G. Olcese, Structure and Magnetic Investigations on Some RAl_2-MAl_2 Laves Phase Systems, *J. Less-Common Metals,* 1985, **111,** p 145-156

2000Oka: H. Okamoto, Al-La (Aluminum-Lanthanum), *J. Phase Equilibria,* 2000, **21**(2), p 205

2004Zan: G. Zanicchi, P. Riani, D. Mazzone, R. Marazza, and R. Ferro, The Isothermal Section at 500 °C of the Al-La-Y Ternary System, *Intermetallics,* 2004, **12,** p 363-371