

Fe-La-Sb (Iron-Lanthanum-Antimony)

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Recently, [2008Liu] determined an isothermal section of this system at 500 °C, which depicts two ternary compounds.

Binary Systems

The Fe-La phase diagram [1997Zha] shows no intermediate phases. The Fe-Sb phase diagram [Massalski2] has two intermediate phases: FeSb_{1-x} ($B8_1$, NiAs-type hexagonal) and FeSb_2 (orthorhombic). In the La-Sb system [Massalski2], the following intermediate compounds were found by [2008Liu] at 500 °C: La_2Sb (La_2Sb -type tetragonal), La_5Sb_3 ($D8_8$, Mn_5Si_3 -type hexagonal), La_4Sb_3 ($D7_3$, Th_3P_4 -type cubic), LaSb ($B1$, NaCl-type cubic), and LaSb_2 (Sb_2Sm -type orthorhombic).

Ternary Compounds

Two ternary compounds were identified by [2008Liu]. $\text{Fe}_4\text{LaSb}_{12}$ (denoted here as τ_1 and as ν by [2008Liu]) is an established compound with the filled-skutterudite $\text{LaFe}_4\text{P}_{12}$ -type of cubic structure, with the lattice parameter $a = 0.91395$ nm. The second compound LaFe_2Sb_2 (denoted here as τ_2 and as N by [2008Liu]) was tentatively indexed by [2008Liu] as the Ga_2Sb_3 -type monoclinic structure, with $a = 0.45518$ nm, $b = 0.77737$ nm, $c = 0.84207$ nm and $\beta = 128.3946^\circ$. A third ternary compound was earlier identified by [1994Lei] at the composition $\text{LaFe}_{1-x}\text{Sb}_2$ in arc-melted samples annealed at 800 °C for 7 days. It has the ZrCuSi_2 -type tetragonal structure (space group $P4/nmm$).

Isothermal Section

With starting metals of 99.9% Fe, 99.9% La, and 99.99% Sb, [2008Liu] arc-melted 118 alloys under Ar atm. The final anneal was at 500 °C for 7 days, followed by quenching in liquid nitrogen. The phase equilibria were studied mainly by x-ray powder diffraction, supplemented with optical microscopy and electron probe microanalysis. The isothermal section

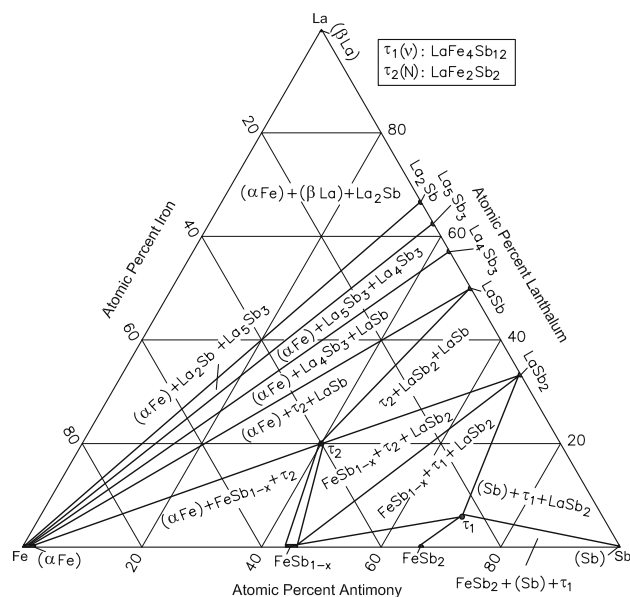


Fig. 1 Fe-La-Sb isothermal section at 500 °C [2008Liu]. Narrow two-phase regions are omitted

at 500 °C constructed by [2008Liu] is shown in Fig. 1. The ternary phase $\text{LaFe}_{1-x}\text{Sb}_2$ found at 800 °C by [1994Lei] was not found by [2008Liu] at 500 °C. No ternary solubility in the binary compounds was indicated by [2008Liu].

References

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