

Al-C-Fe-Nb (Aluminum-Carbon-Iron-Niobium)

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[2003Sch] computed a vertical section for this quaternary system at the composition (in atomic percent) of 1C-2Nb and found qualitative agreement with their experimental results on two alloys containing the above concentration of C and Nb.

Quaternary Phase Equilibria

With starting metals of 99.99% Al, 99.9% graphite, 99.9% Fe and 99.99% Nb, [2003Sch] induction melted two alloys of composition (in atomic percent): Fe-15Al-2Nb-1C and Fe-26Al-2Nb-1C. The alloys were annealed at 1000 °C for 1 month and quenched in water. The phase equilibria were studied by optical and scanning-electron metallography, x-ray diffraction and electron probe microanalysis. The phases identified in the 15 at.% Al alloy were the body-centered cubic (bcc) phase α , NbC and Fe₂Nb (Laves phase). The solubility of Al and Fe in NbC were 0.09 and 3.7 at.% respectively. The solubility of Al in Fe₂Nb was 8.7 at.%. In the

26 at.% Al alloy, the solubility of Al and Fe in NbC was 0.2 and 3.7 at.% respectively.

Using the Thermo-Calc software and the SGTE SSOL database, [2003Sch] computed a vertical section for this quaternary system at 1 at.% C and 2 at.% Nb. This is shown in Fig. 1. In the calculations, NbC, Fe₂Nb, disordered bcc α and face-centered cubic γ were considered as possible phases. The ordering in the Fe-Al bcc phase and the possible presence of the ternary carbide Fe₃AlC were not considered. The computed vertical section was found to be in qualitative agreement with the experimental results [2003Sch] stressed the need to modify the interaction parameters in the database, to account for the significant solubility of Al in Fe₂Nb.

Reference

2003Sch: A. Schneider, L. Falat, G. Sauthoff, and G. Frommeyer, Constitution and Microstructures of Fe-Al-M-C (M = Ti, V, Nb, Ta) Alloys with Carbides and Laves Phase, *Intermetallics*, 2003, **11**, p 443-450

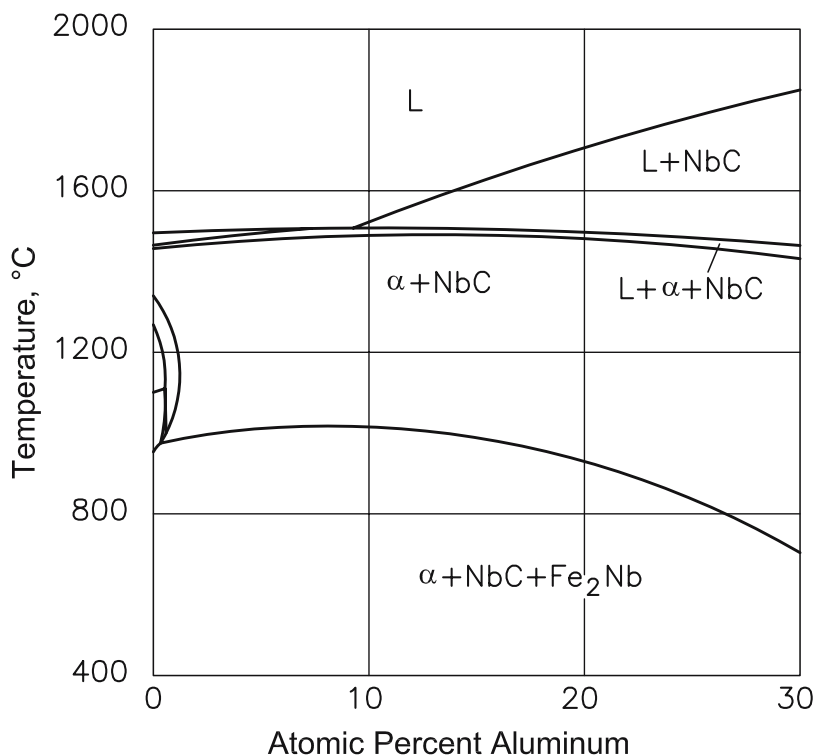


Fig. 1 Al-C-Fe-Nb computed vertical section at 1 at.% C and 2 at.% Nb [2003Sch]