

Er-Fe-Mn (Erbium-Iron-Manganese)

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Recently, [2009Liu] determined an isothermal section for this ternary system at 500 °C. There are no ternary compounds. The solubility of the third component in the Fe-Er and Er-Mn binary phases is extensive (except in Fe_3Er).

Binary Systems

The Er-Fe phase diagram [Massalski2] depicts the following compounds: $\text{Fe}_{17}\text{Er}_2$ ($\text{Ni}_{17}\text{Th}_2$ -type hexagonal), $\text{Fe}_{23}\text{Er}_6$ ($D8_a$, $\text{Mn}_{23}\text{Th}_6$ -type cubic), Fe_3Er (Be_3Nb -type rhombohedral) and Fe_2Er ($C15$, MgCu_2 -type cubic). The Er-Mn phase diagram [Massalski2] has the following intermediate phases: ErMn_{12} ($D2_b$, ThMn_{12} -type tetragonal), $\text{Er}_6\text{Mn}_{23}$ ($D8_a$, $\text{Mn}_{23}\text{Th}_6$ -type cubic) and ErMn_2 ($C14$, MgZn_2 -type hexagonal). There are no intermediate phases in the Fe-Mn system.

Ternary Isothermal Section

With starting metals of 99.9% Er, 99.9% Fe and 99.8% Mn, [2009Liu] arc-melted 256 alloys under Ar atm. The alloys were given a final anneal at 500 °C for 7 days and quenched in liquid nitrogen. The phase equilibria were mainly studied with x-ray powder diffraction. The isothermal section at 500 °C constructed by [2009Liu] is shown in Fig. 1. There are no ternary compounds in the system. The isostructural compounds $\text{Er}_6\text{Mn}_{23}$ and $\text{Fe}_{23}\text{Er}_6$ form a continuous solid solution. The solubility of Fe in ErMn_{12} and ErMn_2 phases is up to ~69 and 13 at.% respectively. The solubility of Mn in Fe_2Er and $\text{Fe}_{17}\text{Er}_2$ is up to 47 and 28 at.% respectively.

Reference

2009Liu: J. Liu, K. Su, X. Li, X. Wang, X. Yang, M. Tang, and C. Li, Phase Relationships in the Er-Fe-Mn Ternary System at 773 K, *J. Alloys Compd.*, 2009, **474**, p 113-117

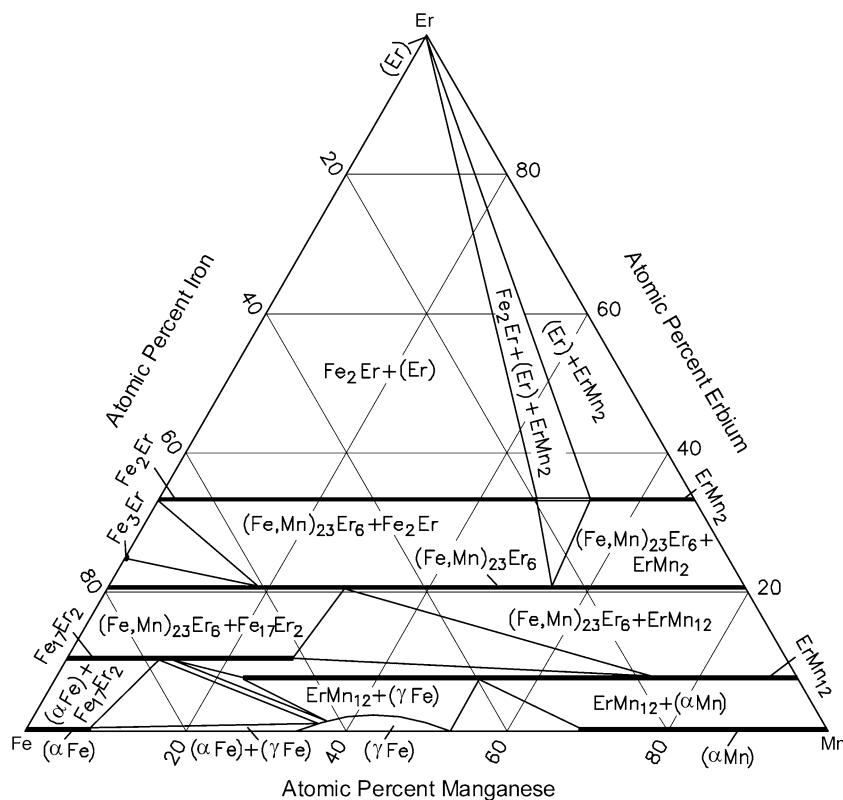


Fig. 1 Er-Fe-Mn isothermal section at 500 °C [2009Liu]