

Fe-P-Re (Iron-Phosphorus-Rhenium)

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This system has not been reviewed before. [83Ori] determined an isothermal section for this system at 797 °C.

Binary Systems and Phases

[88Rag] presented a brief review of the Fe-P phase diagram. A partial Fe-Re phase diagram was constructed by [92Rag], based on the binary information from several ternary diagrams. The P-Re diagram is not known. There are six compounds in the P-Re system: Re_2P , Re_3P_4 , Re_6P_{13} , Re_2P_5 , ReP_3 , and ReP_4 . See [Pearson3] for structural data.

Isothermal Section at 797 °C

Using starting materials of 99.99% Fe, 99.9% Re, and 99.98% P, [83Ori] prepared 56 alloys, which were annealed at 797 °C (1070 K) for 500 h. The phase equilibria were studied by x-ray powder diffraction and metallographic techniques. Their isothermal section at 797 °C is redrawn in Fig. 1 to agree with the accepted binary data. Along the Fe-Re side, in addition to the terminal solid solutions, [83Ori] depict two compounds Fe_3Re_2 (σ) and FeRe_2 . According to the Fe-Re diagram of [92Rag], the σ phase decomposes just above 800 °C. However, as this diagram is tentative, the σ phase is indicated at 797 °C as per the results of [83Ori]. [83Ori] depict only four compounds along the Re-P side. Figure 1 includes tentatively the other two compounds: Re_2P_5 and ReP_3 . The ternary compound FeReP (τ) forms tie lines with a number of binary compounds surrounding it. It has the Co_2Si -type orthorhombic structure with $a = 0.5509$, $b = 0.3688$, and $c = 0.6714$ nm [83Ori].

Cited References

83Ori: S.V. Orishchin, Yu. B. Kuzma, R.M. Tereletsii, and Ya.G. Dankevich, "Interaction of Re with Iron Triad Metals and P," *Issled.*

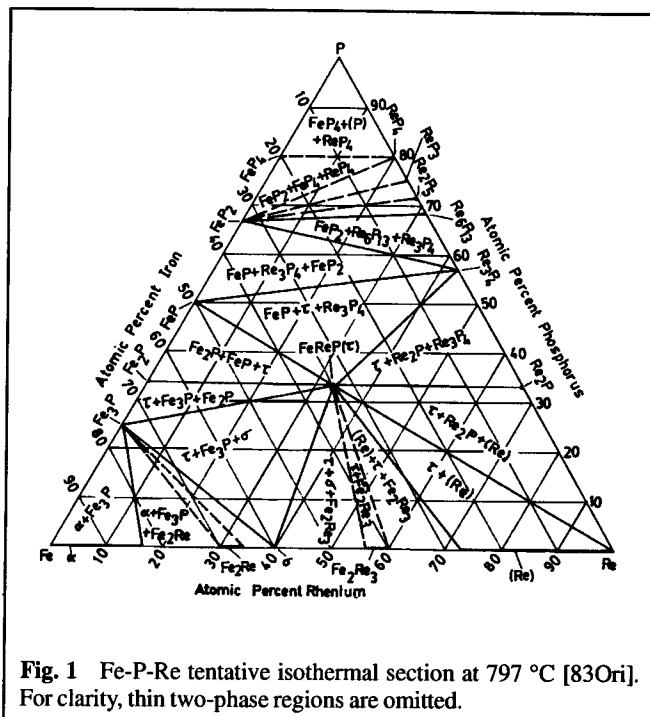


Fig. 1 Fe-P-Re tentative isothermal section at 797 °C [83Ori]. For clarity, thin two-phase regions are omitted.

Primenenie Splavov Tugoplav. Vet., M, 11-15 (1983) in Russian. (Experimental; #)

88Rag: V. Raghavan, "The Fe-P System," *Phase Diagrams of Ternary Iron Alloys, Part 3*, Indian Institute of Metals, Calcutta, 5-8 (1988). (Review; #)

92Rag: V. Raghavan, "Fe-Re," *Phase Diagrams of Ternary Iron Alloys, Part 6A*, Indian Institute of Metals, Calcutta, 47-48 (1992). (Review; #)

Indicates presence of a phase diagram.

Fe-P-Tb (Iron-Phosphorus-Terbium)

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This system has not been reviewed before. Recently, [90Chi] determined an isothermal section for this system at 797 °C.

Binary Systems and Phases

[88Rag] briefly reviewed the Fe-P phase diagram and its intermediate phases. See [Massalski2] for the Fe-Tb phase diagram. The P-Tb diagram is not known. There is one inter-

mediate phase in this system: TbP, which has the NaCl-type structure with $a = 0.5688$ nm.

Ternary Compounds

Two ternary compounds are known in this system: $\text{Fe}_{12}\text{Tb}_2\text{P}_7$ (τ_1) and Fe_3TbP_3 (τ_2) [84Jei, 90Chi]. τ_1 has the $\text{Fe}_{12}\text{Zr}_2\text{P}_7$ -type hexagonal structure, with $a = 0.91333$ nm and $c = 0.36460$ nm. τ_2 has the Co_5YP_3 -type orthorhombic