JPEDAV (2006) 27:297
DOI: 10.1361/154770306X109917
1547-7037/$19.00 ©ASM International

Fe-Pr-Pt (Iron-Praseodymium-Platinum)

V. Raghavan

Recently, [2005Ren] determined an isothermal section for this system at 900 °C. No ternary compounds were found. The solubility of Pr in Fe-Pt phases was found to be significant.

Binary Systems

The Fe-Pr phase diagram [1999Zha] depicts only one intermetallic compound $Fe_{17}Pr_2$ (Th_2Zn_{17}-type rhombohedral). Both the reported crystalline forms of Fe_2Pr (*C*14 and *C*15) are metastable. The Fe-Pt phase diagram [2004Oka] depicts a continuous solid solution (γ) between Pt and the face-centered cubic (fcc) Fe. Three ordered structures, Fe_3Pt ($AuCu_3$-type cubic), FePt (AuCu-type tetragonal), and $FePt_3$ ($AuCu_3$-type cubic), form congruently from γ at ~840, ~1300, and ~1350 °C, respectively. The Pr-Pt phase diagram [2005Ren, Massalski2] shows a number of intermediate compounds: $PrPt_5$ ($CaCu_5$-type hexagonal), $PrPt_3$ ($AuCu_3$-type cubic), $PrPt_2$ ($MgCu_2$-type cubic), Pr_3Pt_4 (Pd_4Pu_3-type rhombohedral), αPrPt (FeB-type orthorhombic), βPrPt (CrB-type orthorhombic), Pr_3Pt_2 (Er_3Ni_2-type rhombohedral), and Pr_7Pt_3 (Fe_3Th_7-type hexagonal).

Ternary Isothermal Section

With starting metals of purity greater than 99.9% and under Ar atmosphere, [2005Ren] arc-melted 60 alloy compositions with Pr contents up to 70 at.%. The samples were annealed at 900 °C for 2 weeks and quenched in water. The phase equilibria were studied by x-ray diffraction, scanning electron microscopy, and energy dispersive spectroscopy. The isothermal section at 900 °C constructed by [2005Ren] is redrawn in Fig. 1 to agree with the accepted binary data. No ternary compounds were found in the system. The solubilities of Pr in (αFe), γ, FePt, $FePt_3$, and (Pt) were found to be 6, 2, 4, 4.5, and 1.5 at.%, respectively. The solubility of Fe in Pr-Pt compounds is less than 1 at.%. The binary compound Pr_3Pt_4 was not found at 900 °C. It is probably destabilized by small amounts of Fe [2005Ren]. The phase relationships in the high-Pr region are not known.

References

1999Zha: W. Zhang, C. Li, and X. Su, The Fe-Pr (Iron-Praseodymium) System, *J. Phase Equilib.,* 1999, **20**(2), p 158-162

2004Oka: H. Okamoto, Fe-Pt (Iron-Platinum), *J. Phase Equilib. Diffusion,* 2004, **25**(4), p 395

2005Ren: J. Ren, Z. Gu, G. Cheng, and H. Zhou, Solid State Phase Equilibria in the Fe-Pt-Pr Ternary System at 1173 K, *J. Alloys Compd.,* 2005, **394,** p 211-214

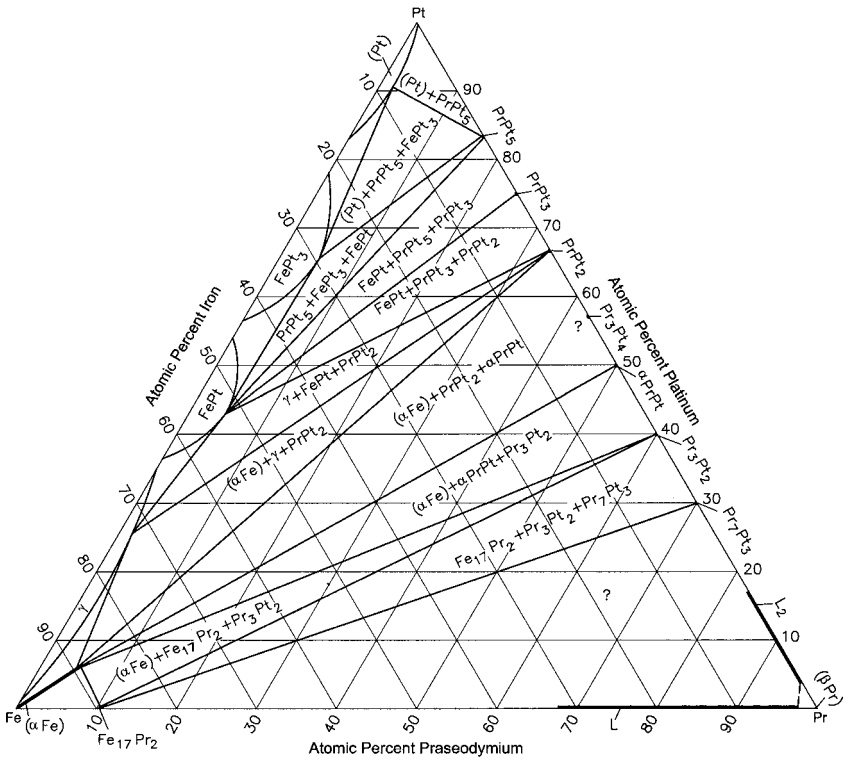

Fig. 1 Fe-Pr-Pt isothermal section at 900 °C [2005Ren]