

Mg-Pd (Magnesium-Palladium)

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The Mg-Pd phase diagram in [Massalski2] was redrawn from [1985Nay]. The diagram was mostly speculative. Accordingly, the entire phase diagram was drawn with dotted lines.

[2006Mak] determined the Mg-Pd phase diagram in detail for the range 0-55 at.% Pd by means of x-ray spectroscopy, differential thermal analysis, and differential scanning calorimetry. The result is shown in Fig. 1. New phases γ , δ , and ζ

were found. The figure has been slightly modified to make phase boundary lines agree with labels given in [2006Mak] diagram. Figure 1 for the composition range from 55 to 100 at.% Pd is as drawn by [1985Nay]. Special points of the phase diagram are summarized in Table 1. Solid solubility ranges of phases have been read from the figure.

Mg-Pd crystal structure data shown in Table 2 was adopted from [1985Nay].

Table 1 Special points of the Mg-Pd phase diagram

Reaction	Compositions of the respective phases, at.% Pd			Temperature, °C	Reaction type
L → (Mg)		0		650	Melting
L → (Mg) + Mg ₆ Pd	8.5	0	12.7	539	Eutectic
L → Mg ₆ Pd		14.3		571	Congruent
L → Mg ₆ Pd + δ	17	15.2	19	559	Eutectic
Mg ₆ Pd + δ → γ	15.2	19	18.6	554	Peritectoid
γ → Mg ₆ Pd + ?	18.6	15.2	?	534	Eutectoid
L + ε → δ	17.2	20.1	19.5	562	Peritectic
L + ζ → ε	17.4	21	20.1	565	Peritectic
L + Mg ₃ Pd → ζ	19	25	21.8	580	Peritectic
L + Mg ₅ Pd ₂ → Mg ₃ Pd	21.7	27	25	625	Peritectic
L → Mg ₅ Pd ₂		28.6		697	Congruent
L → Mg ₅ Pd ₂ + MgPd	32	28.1	46.7	690	Eutectic
Mg ₅ Pd ₂ + MgPd → Mg ₂ Pd	28.4	46.8	33.3	681	Peritectoid
L + Mg _{0.9} Pd _{1.1} → MgPd	43.7	55	50.5	1003	Peritectic
L → Mg _{0.9} Pd _{1.1}		55		1350	Congruent
L → Mg _{0.9} Pd _{1.1} + (Pd)	63.7	55	75	1280	Peritectic
L → (Pd)		100		1555	Melting

Table 2 Mg-Pd crystal structure data

Phase	Composition, at.% Pd	Pearson symbol	Space group	Strukturbericht designation	Prototype
(Mg)	0	<i>hP2</i>	<i>P6₃/mmc</i>	<i>A3</i>	Mg
Mg ₆ Pd	12.7-15.2	<i>cF396</i>	<i>Fm$\bar{3}m$</i>	...	...
γ (Mg ₅₇ Pd ₁₃)	18.6	...	...	...	...
δ (Mg _{56.4} Pd _{13.5})	19-19.5	...	...	...	...
ε (Mg ₃₀₆ Pd ₇₇)	20.1	...	...	...	...
ζ (Mg _{78.5} Pd _{21.5})	21-21.8	...	...	...	...
Mg ₃ Pd	25	<i>hP8</i>	<i>P6₃/mmc</i>	<i>D0₁₈</i>	Na ₃ As
Mg ₅ Pd ₂	27-28.4	<i>hP28</i>	<i>P6₃/mmc</i>	<i>D8₁₁</i>	Al ₅ Co ₂
Mg ₂ Pd	33.3	...	...	...	...
MgPd	45.5-50.5	<i>cP2</i>	<i>Pm$\bar{3}m$</i>	<i>B2</i>	CsCl
Mg _{0.9} Pd _{1.1}	55	<i>tP4</i>	<i>P4/mmm</i>	<i>L1₀</i>	AuCu
(Pd)	75-100	<i>cF4</i>	<i>Fm$\bar{3}m$</i>	<i>A1</i>	Cu

Section III: Supplemental Literature Review

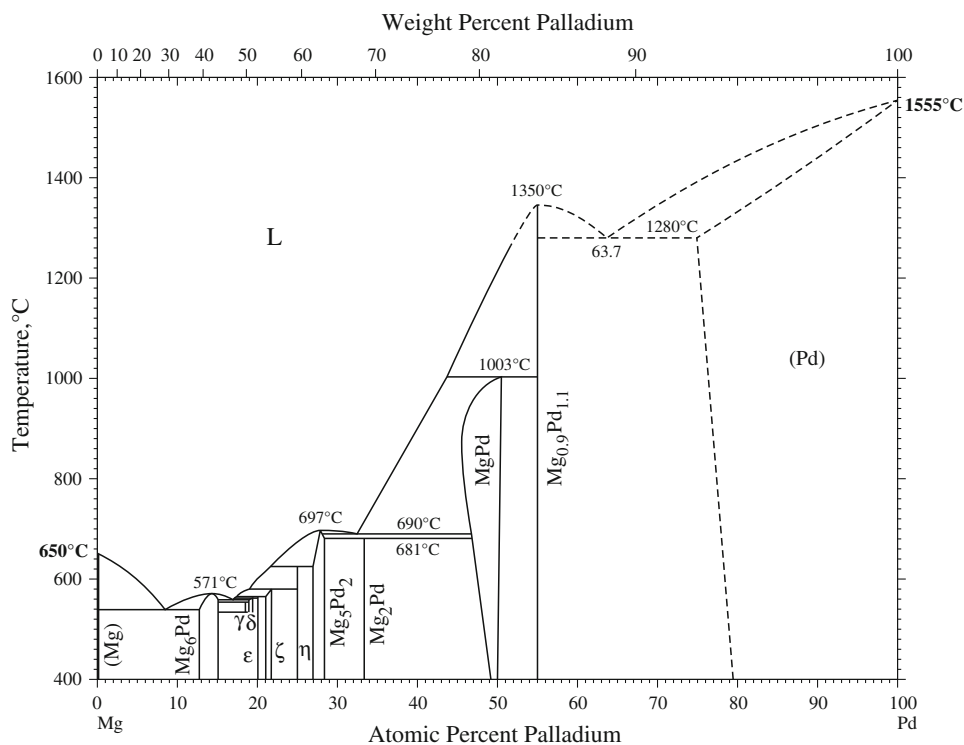


Fig. 1 Mg-Pd phase diagram

References

1985Nay: A.A. Nayeb-Hashemi and J.B. Clark, The Mg-Pd (Magnesium-Palladium) System, *Bull. Alloy Phase Diagr.*, 1985, **6**(2), p 164-167

2006Mak: J.P.A. Makong, Y. Prots, U. Burkhardt, R. Niewa, C. Kudla, and G. Kreiner, A Case Study of Complex Metallic Alloy Phases: Structure and Disorder Phenomena of Mg-Pd Compounds, *Phil. Mag.*, 2006, **86**(3-5), p 427-433