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Ga-Pu (Gallium-Plutonium)

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The Ga-Pu phase diagram in [Massalski2] was redrawn from [1988Pet]. This diagram was similar to that shown in Fig. 1, but the (δPu) phase was shown to be stable down to at least 0 °C. However, [1991Adl] suggested that (δPu) decomposes into $\alpha GaPu_3$ and (αPu) by a eutectoid reaction at around 81 °C, based on thermodynamic modeling. [2007Tur] proposed the complete Ga-Pu phase diagram, as shown in Fig. 1, by thermodynamic calculations. This phase diagram is in agreement with [1991Adl]. [2007Mas] reviewed the above reports and discussed the nature of the (δPu) phase at low temperatures.

Table 1 shows Ga-Pu crystal structure data from [1988Pet] with modifications to agree with Fig. 1.

References

1988Pet: D.E. Peterson and M.E. Kassner, The Ga-Pu (Gallium-Plutonium) System, *Bull. Alloy Phase Diagram*, 1988, **9**(3), p 261-267

1991Adl: P.H. Adler, Thermodynamic Equilibrium in the Low-Solute Regions of Pu-Group IIIA Metal Binary Systems, *Metall. Trans. A*, 1991, **22A**(10), p 2237-2246

2007Mas: T.B. Massalski and A.J. Schwartz, Connections Between the Pu-Ga Phase Diagram in the Pu-Rich Region and the Low Temperature Phase Transformations, *J. Alloy Compd.*, 2007, **444-445**, p 98-103

2007Tur: P.E.A. Turchi, L. Kaufman, S. Zhou, and Z.K. Liu, Thermostatics and Kinetics of Transformations in Pu-Based Alloys, *J. Alloy Compd.*, 2007, **444-445**, p 28-35

Table 1 Ga-Pu crystal structure data

Phase	Composition, at.% Pu	Pearson symbol	Space group	Strukturbericht designation	Prototype
(Ga)	0	*oC*8	*Cmca*	*A*11	Ga
$Ga_{15}Pu_2$	11.8	*t***	...	...	...
Ga_6Pu	14.3	*tP*14	*P*4/*nbm*	...	...
Ga_4Pu	20	*oI*20	*Imma*	$D1_b$	Al_4U
$Ga_{3.7}Pu$	21.3	...	...	...	...
Ga_7Pu_2	22.2	*t***	...	...	...
γGa_3Pu	25	...	...	...	...
βGa_3Pu	25	*hP*8	$P6_3/mmc$	$D0_{19}$	Ni_3Sn
αGa_3Pu	25	*hR*16	$R\bar{3}m$	...	...
Ga_2Pu	33.3	*hP*3	*P*6/*mmm*	*C*32	AlB_2
Ga_3Pu_2	40	*hP**	...	...	...
βGaPu	50	*cI*2	$Im\bar{3}m$	*A*2	W
αGaPu	50	*tI*2	*I*4/*mmm*	*A*6	In
η	60-79	*cI*16	$I2_13$	...	...
Ga_3Pu_5	62.5	*tI*32	*I*4/*mcm*	$D8_m$	W_5Si_3
$\beta GaPu_3$	75	*cP*4	$Pm\bar{3}m$	$L1_2$	$AuCu_3$
$\alpha GaPu_3$	75	*tP*4	*P*4/*mmm*	$L6_0$	Pb_3Sr
(εPu)	89.5-100	*cI*2	$Im\bar{3}m$	*A*2	W
(δ′Pu)	100	*tI*2	*I*4/*mmm*	*A*6	In
(δPu)	86-100	*cF*4	$Fm\bar{3}m$	*A*1	Cu
(γPu)	100	*oF*8	*Fddd*	...	γPu
(βPu)	100	*mC*34	*C*2/*m*	...	βPu
(αPu)	100	*mP*16	$P2_1/m$	...	αPu

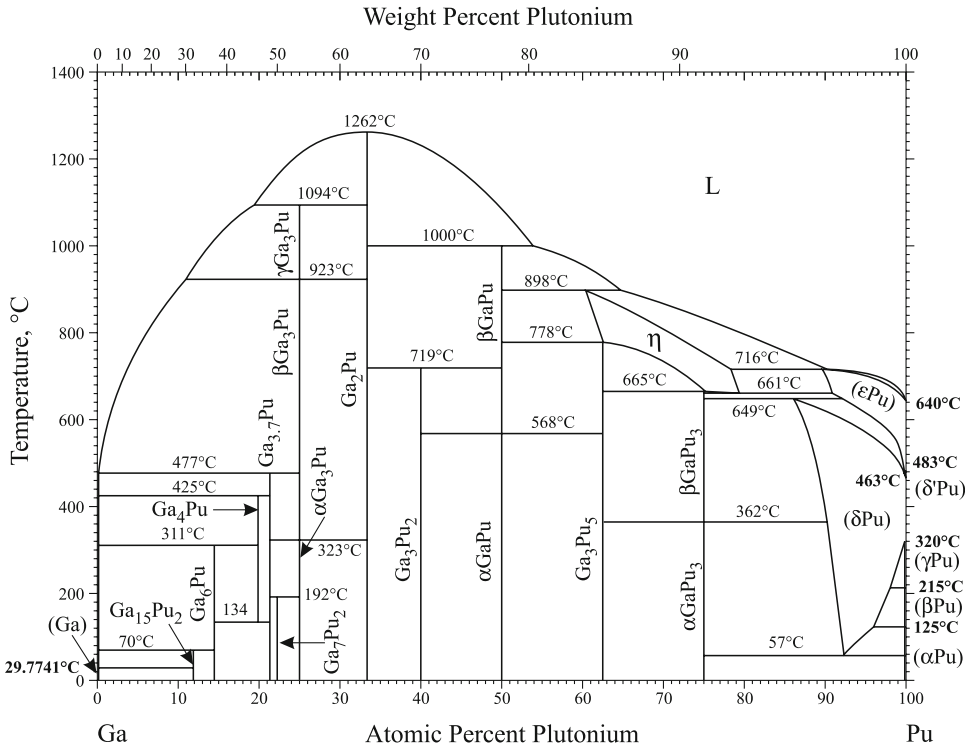

Fig. 1 Ga-Pu phase diagram