

# Ag-Ga

Phase	Space Group <sup>1</sup>	Lattice Parameter <sup>1</sup> (nm)	Diffusion Coefficient, D <sup>†</sup>		
			Diffusing Element	D <sub>0</sub> (m <sup>2</sup> /sec)	Q (kJ/mole)
Ag	cubic $Fm\bar{3}m$	a=0.4086	<sup>2</sup> Ag (550 –1228 K)	D <sub>1</sub> <sup>0</sup> =5.5x10 <sup>-6</sup>	Q <sub>1</sub> <sup>0</sup> =171.1
				D <sub>2</sub> <sup>0</sup> =1.51x10 <sup>-3</sup>	Q <sub>2</sub> <sup>0</sup> =226.7
			<sup>2</sup> Ga (873 - 1213 K)	D <sub>0</sub> =4.2x10 <sup>-5</sup>	Q=162.19
ζ <sup>1</sup>	rhomboidal <sup>3</sup> $P\bar{3}$				
Ga	ortho-rhombic Cmca	a=0.4523 b=0.7661 c=0.4524	<sup>2</sup> Ga	D = 5.3x10 <sup>-17</sup> (282.8 K)	
				D = 4.2x10 <sup>-16</sup> (302.7 K)	

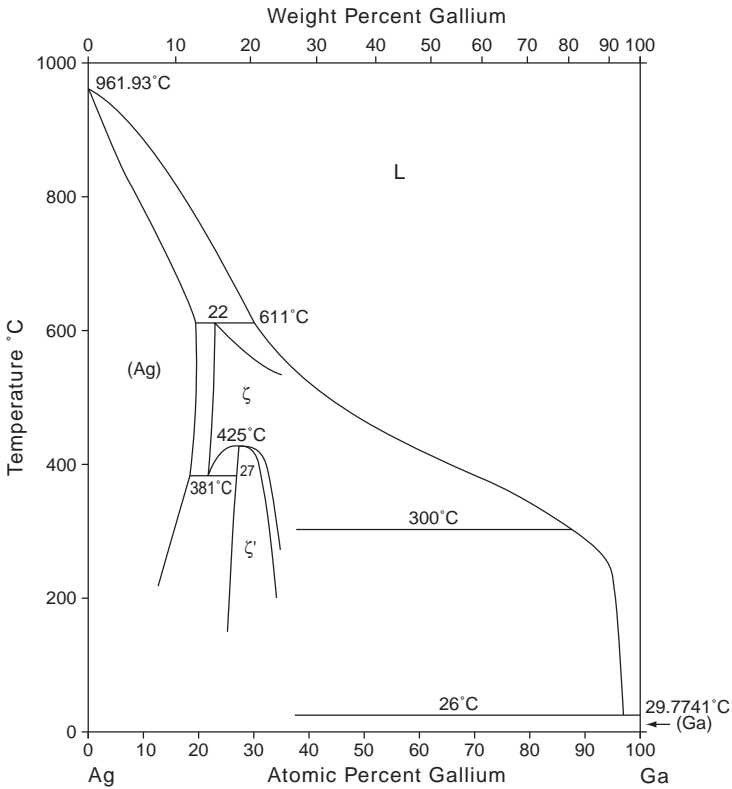
<sup>1</sup> W.B. Pearson, *A Handbook of Lattice Spacings and Structures of Metals and Alloys*, Vol. 2, Pergamon Press, 1967, pp. 80, 82, 101.

<sup>2</sup> E. A. Brandes and G.B. Brook, *Smithells Metals Reference Book*, 7<sup>th</sup> Ed., Butterworth-Heinemann, 1992, pp. 13-9, 13-10, 13-15.

<sup>3</sup> Baren, M.R., "The Ag-Ga (Silver-Gallium) System," *Bull. Alloy Phase Diag.*, **18**, No. 4, 1990, pp. 336.

<sup>†</sup>  $D = D_0 \exp(-Q/kT)$  or  $[D = D_{10} \exp(-Q_1/kT) + D_{20} \exp(-Q_2/kT)]$

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The diagram is redrawn from Baren (1), and is based mainly on the work of Hume-Rothery et al (2,3) and Predel et al (4). The system is characterized by a peritectic reaction at 611°C, an eutectoid reaction at 381°C and the z-z' order-disorder reaction which occurs over a range of compositions on the Silver-rich side.

- (1) Baren, M.R., "The Ag-Ga (Silver-Gallium) System," *Bull. Alloy Phase Diag.*, **18**, No. 4, 1990; pp. 334-339.
- (2) Hume-Rothery, W., and Andrews, K.W., "The Equilibrium Diagram of the System Silver-Gallium. I-The a-phase Region," *J.Inst. Met.*, **68**, 1942; pp. 133-143.
- (3) Hume-Rothery, W., and Andrews, K.W., "The Equilibrium Diagram of the System Silver-Gallium," *Z. Metallkd.*, **60**, 1958; pp. 661-662.
- (4) Predel, B., and Stein, D.W., "The Enthalpies of Formation of Binary Compounds of Gallium with Copper, Silver and Gold and an Analysis of the Thermodynamic Characteristics of 3/2 Electron Compounds," *Acta Metall.*, **20**, 1972; pp. 681-692.

# Cu-Ga

Phase	Space Group <sup>1</sup>	Lattice Parameter <sup>1</sup> (nm)	Diffusion Coefficient, D <sup>†</sup>		
			Diffusing Element	D <sub>0</sub> (m <sup>2</sup> /sec)	Q (kJ/mole)
Cu	cubic <i>Fm</i> $\bar{3}m$	a=0.36147	<sup>2</sup> Cu (573- 1334K)	D <sub>1</sub> <sup>0</sup> =1.3x10 <sup>-5</sup>	Q <sub>1</sub> <sup>0</sup> =197.8
				D <sub>2</sub> <sup>0</sup> =4.5x10 <sup>-4</sup>	Q <sub>2</sub> <sup>0</sup> =237.4
β	cubic <i>Im</i> 3m	a=0.29671			
γ	cubic <i>P</i> 43m				
γ <sub>1</sub>	cubic <i>P</i> 43m	a=0.87296 at 31 a/o Ga			
γ <sub>2</sub>	cubic <i>P</i> 43m	a=0.87315 at 31 a/o Ga			
γ <sub>3</sub>	cubic <i>P</i> 43m	a=0.86922 at 31 a/o Ga			
ζ	hexagonal <i>P</i> 6 <sub>3</sub> /mmc	a=0.26007 c=0.42433 at 22 a/o Ga			
υ	tetragonal <sup>3</sup> <i>P</i> 4/mmm				
Ga	ortho- rhombic <i>Cmca</i>	a=0.4523 b=0.7661 c=0.4524	<sup>2</sup> Ga	D = 5.3x10 <sup>-17</sup> (282.8 K)	
				D = 4.2x10 <sup>-16</sup> (302.7 K)	

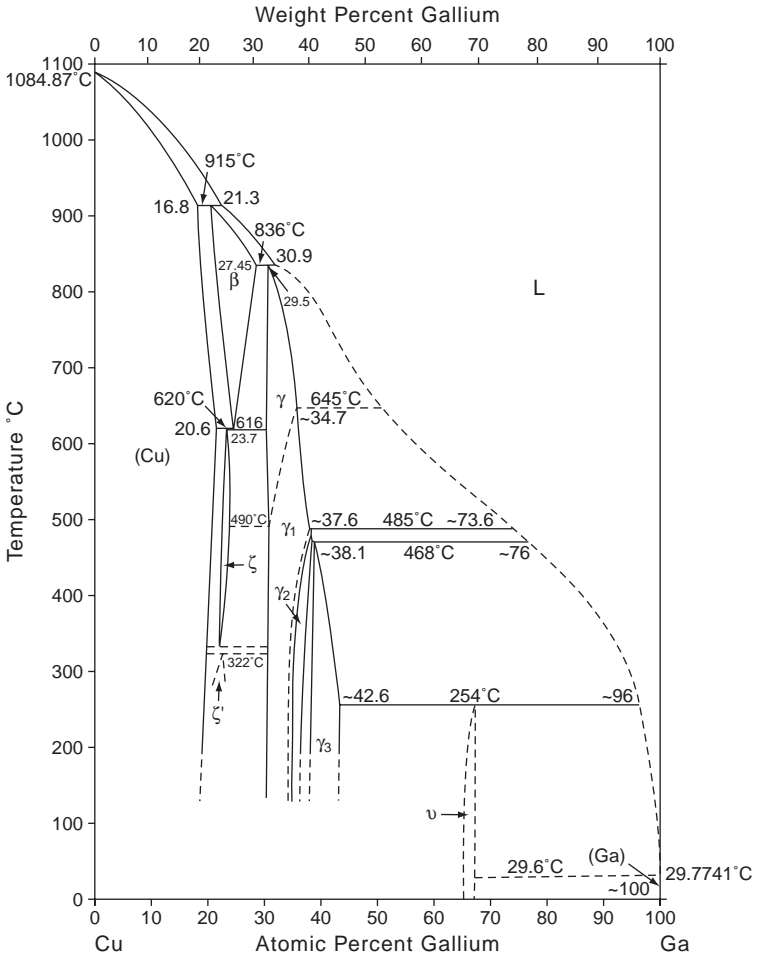
<sup>1</sup> W.B. Pearson, *A Handbook of Lattice Spacings and Structures of Metals and Alloys*, Vol. 2, Pergamon Press, 1967, pp. 81, 82, 222, 223.

<sup>2</sup> E. A. Brandes and G.B. Brook, *Smithells Metals Reference Book*, 7<sup>th</sup> Ed., Butterworth-Heinemann, 1992, pp. 13-9, 13-10.

<sup>3</sup> Subramanian, P.R., and Laughlin, D.E., in *Binary Alloy phase Diagrams*, 2<sup>nd</sup> edition, edited by Massalski, T.B., ASM International, Materials Park, OH, 1990, pp. 1410-1412.

<sup>†</sup>  $D = D_0 \exp(-Q/kT)$  or  $[D = D_1^0 \exp(-Q_1^0/kT) + D_2^0 \exp(-Q_2^0/kT)]$

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The diagram is redrawn from Massalski (1), which is similar to that presented in Hansen (2), with modifications to the z phase field, based on results of Kittl et al (3).

- (1) Subramanian, P.R., and Laughlin, D.E., in *Binary Alloy phase Diagrams*, 2<sup>nd</sup> edition, edited by Massalski, T.B., ASM International, Materials Park, OH, 1990; pp. 1410-1412.
- (2) Hansen, M., *Constitution of Binary Alloys*, 2<sup>nd</sup> edition, McGraw Hill, 1958; p. 582-584.
- (3) Kittl, J.E., and Massalski, T.B., *J.Inst. Met.*, **93**, 1964; pp. 182-188.