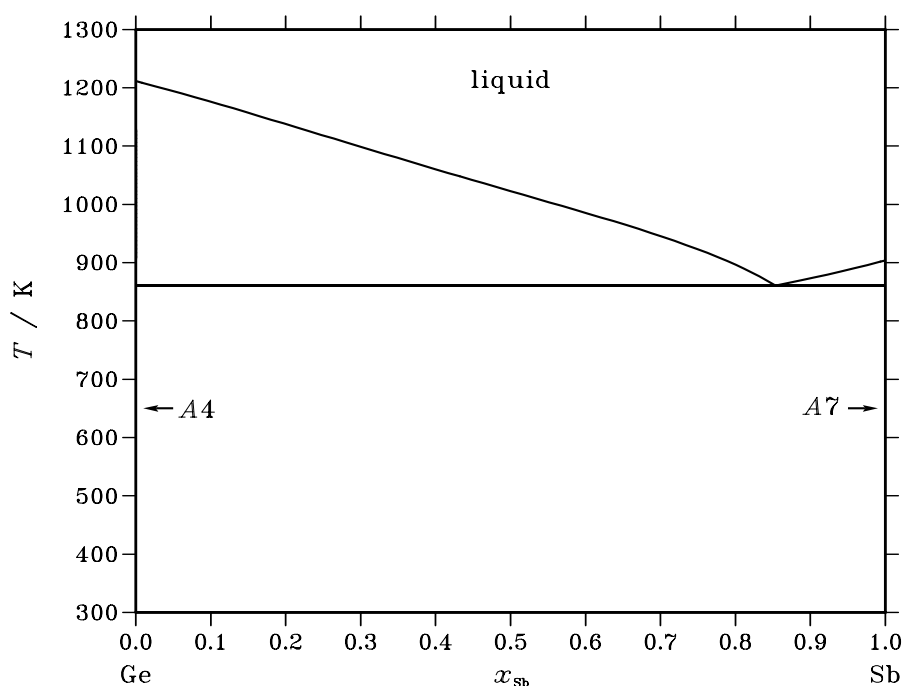


Ge – Sb (Germanium – Antimony)**Fig. 1.** Calculated phase diagram for the system Ge-Sb.

The Ge-Sb system has been reviewed in [86Ole] and a thermodynamic assessment has been given by Chevalier [89Che] which has been updated later [03Che]. The phase diagram is rather simple and of eutectic type, located on the Sb rich side, with complete mutual solubility in the liquid, a very limited retrograde solid solubility of Sb in solid Ge [53Thu, 56Thu, 59Zhu, 62Tru, 78Ako, 78Gla] and an unknown but negligible solubility of Ge in pure antimony. There is no compound in the system and the solution phases were described as substitutional solutions. The liquidus has been determined in several investigations [40Rut, 40Sto, 59Zhu, 72Mal, 83Alf]. The mixing enthalpy of liquid alloys has been investigated by Predel and Stein [70Pre] and Alfer *et al.* [81Alf] who obtained smaller positive heats of mixing than [70Pre]. More recent calorimetric data [99Kos] suggested a re-assessment of the system [03Che]. Further experimental work would be necessary to select definitively the enthalpy of mixing of liquid alloys between [70Pre] or [81Alf].

Table I. Phases, structures and models.

Phase	Strukturbericht	Prototype	Pearson symbol	Space group	SGTE name	Model
liquid					LIQUID	(Ge,Sb) ₁
A4	A4	C(diamond)	<i>cF</i> 8	<i>Fd</i> $\bar{3}m$	DIAMOND_A4	(Ge,Sb) ₁
A7	A7	α As	<i>hR</i> 2	<i>R</i> $\bar{3}m$	RHOMBOHEDRAL_A7	Sb ₁

Table II. Invariant reactions.

Reaction	Type	T / K	Compositions / x_{Sb}			$\Delta_r H / (J/mol)$
liquid \rightleftharpoons A4 + A7	eutectic	860.7	0.854	0.000	1.000	-22734

Table IIIa. Integral quantities for the liquid phase at 1273 K.

x_{Sb}	ΔG_{m} [J/mol]	ΔH_{m} [J/mol]	ΔS_{m} [J/(mol·K)]	G_{m}^{E} [J/mol]	S_{m}^{E} [J/(mol·K)]	ΔC_P [J/(mol·K)]
0.000	0	0	0.000	0	0.000	0.000
0.100	−3395	294	2.898	46	0.196	0.000
0.200	−5104	513	4.413	192	0.252	0.000
0.300	−6067	660	5.284	399	0.205	0.000
0.400	−6500	740	5.687	623	0.091	0.000
0.500	−6513	754	5.709	824	−0.054	0.000
0.600	−6166	709	5.400	958	−0.195	0.000
0.700	−5481	607	4.783	985	−0.296	0.000
0.800	−4435	452	3.839	862	−0.321	0.000
0.900	−2893	249	2.468	547	−0.235	0.000
1.000	0	0	0.000	0	0.000	0.000

Reference states: Ge(liquid), Sb(liquid)

Table IIIb. Partial quantities for Ge in the liquid phase at 1273 K.

x_{Ge}	ΔG_{Ge} [J/mol]	ΔH_{Ge} [J/mol]	ΔS_{Ge} [J/(mol·K)]	G_{Ge}^{E} [J/mol]	S_{Ge}^{E} [J/(mol·K)]	a_{Ge}	γ_{Ge}
1.000	0	0	0.000	0	0.000	1.000	1.000
0.900	−1173	38	0.952	−58	0.075	0.895	0.995
0.800	−2537	149	2.109	−175	0.254	0.787	0.984
0.700	−4043	323	3.430	−268	0.464	0.682	0.975
0.600	−5660	554	4.882	−254	0.634	0.586	0.976
0.500	−7384	834	6.456	−48	0.692	0.498	0.996
0.400	−9265	1155	8.186	433	0.567	0.417	1.042
0.300	−11471	1510	10.197	1273	0.186	0.338	1.128
0.200	−14481	1891	12.861	2554	−0.521	0.255	1.273
0.100	−20009	2290	17.518	4362	−1.627	0.151	1.510
0.000	−∞	2701	∞	6779	−3.204	0.000	1.897

Reference state: Ge(liquid)

Table IIIc. Partial quantities for Sb in the liquid phase at 1273 K.

x_{Sb}	ΔG_{Sb} [J/mol]	ΔH_{Sb} [J/mol]	ΔS_{Sb} [J/(mol·K)]	G_{Sb}^{E} [J/mol]	S_{Sb}^{E} [J/(mol·K)]	a_{Sb}	γ_{Sb}
0.000	−∞	3335	∞	−191	2.770	0.000	0.982
0.100	−23397	2599	20.421	975	1.276	0.110	1.096
0.200	−15373	1972	13.625	1662	0.243	0.234	1.170
0.300	−10788	1448	9.611	1956	−0.399	0.361	1.203
0.400	−7760	1018	6.895	1939	−0.723	0.480	1.201
0.500	−5642	675	4.962	1695	−0.801	0.587	1.174
0.600	−4099	412	3.544	1308	−0.704	0.679	1.132
0.700	−2914	220	2.462	861	−0.503	0.759	1.085
0.800	−1923	93	1.584	438	−0.272	0.834	1.042
0.900	−992	22	0.796	124	−0.080	0.911	1.012
1.000	0	0	0.000	0	0.000	1.000	1.000

Reference state: Sb(liquid)

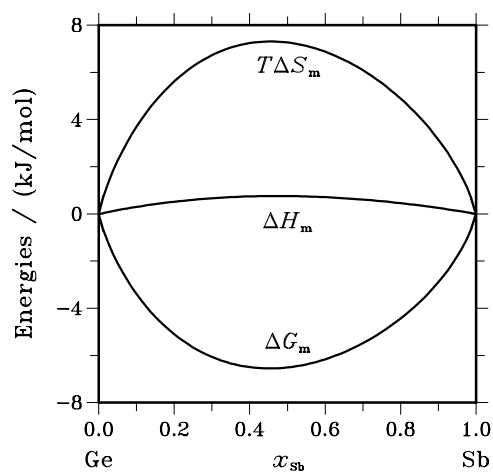


Fig. 2. Integral quantities of the liquid phase at $T=1273$ K.

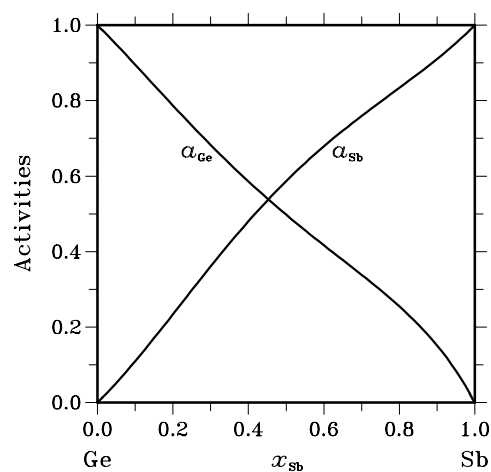


Fig. 3. Activities in the liquid phase at $T=1273$ K.

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