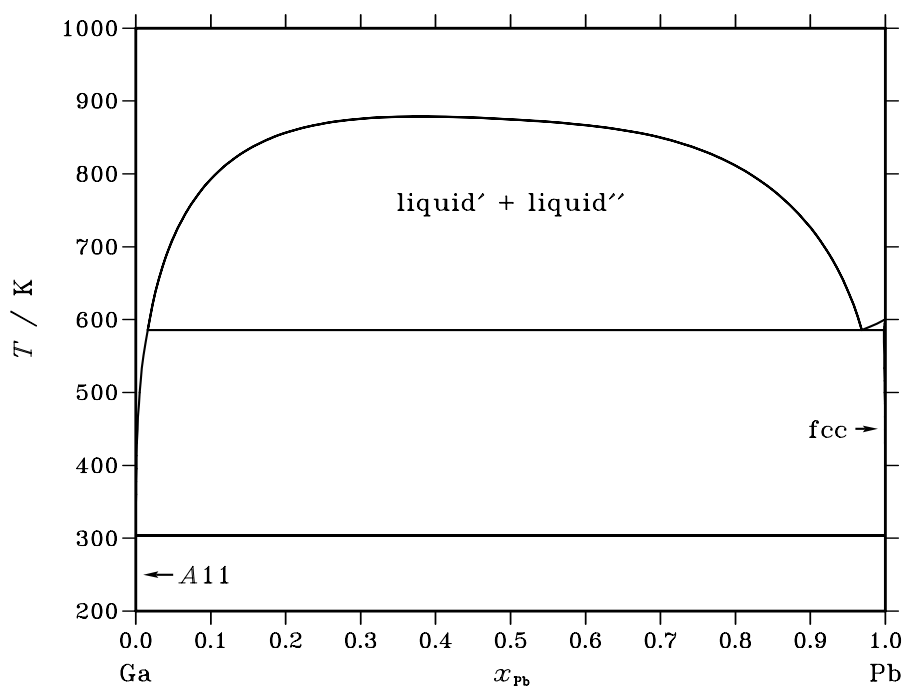


Ga – Pb (Gallium – Lead)**Fig. 1.** Calculated phase diagram for the system Ga-Pb.

The mutual solubility of gallium and lead is limited in the solid and the liquid state. The resulting liquid miscibility gap vanished for temperatures above 873 K. A review of the existing experimental information as well as a thermodynamic modelling has been performed by Ansara and Ajersch [91Ans]. The assessment is based on phase diagram work by Predel [59Pre] who studied the system in its entire range by differential thermal analysis. Calorimetric data has been published by Bros [68Bro] and Predel *et al.* [71Pre] and activities have been determined by Desideri *et al.* [73Des] and Kononenko *et al.* [75Kon]. The assessment is in good agreement with the experimental data, except the composition of the monotectic on the Pb rich side. Experimentally, a value of 94.5 at.% Pb is given, the calculation gives a composition of the liquid of 96.9 at.% Pb.

Table I. Phases, structures and models.

Phase	Strukturbericht	Prototype	Pearson symbol	Space group	SGTE name	Model
liquid					LIQUID	(Ga,Pb) ₁
fcc	A1	Cu	<i>cF4</i>	<i>Fm$\bar{3}m$</i>	FCC-A1	(Ga,Pb) ₁
A11	A11	α Ga	<i>oC8</i>	<i>Cmca</i>	ORTHORHOMBIC_CMCA	Ga ₁

Table II. Invariant reactions.

Reaction	Type	T / K	Compositions / x_{Pb}			$\Delta_f H / (J/mol)$
liquid \rightleftharpoons liquid' + liquid''	critical	878.6	0.380	0.380	0.380	0
liquid'' \rightleftharpoons liquid' + fcc	monotectic	585.8	0.969	0.016	0.998	−5127
liquid' \rightleftharpoons A11 + fcc	eutectic	302.9	0.000	0.000	1.000	−5591

Table IIIa. Integral quantities for the liquid phase at 923 K.

x_{Pb}	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	−802	1886	2.912	1692	0.210	0.000
0.200	−963	3008	4.302	2878	0.142	0.000
0.300	−1036	3603	5.026	3652	−0.053	0.000
0.400	−1084	3845	5.340	4081	−0.256	0.000
0.500	−1120	3848	5.382	4200	−0.381	0.000
0.600	−1144	3664	5.209	4021	−0.387	0.000
0.700	−1149	3286	4.805	3539	−0.274	0.000
0.800	−1109	2646	4.068	2731	−0.092	0.000
0.900	−930	1614	2.756	1565	0.053	0.000
1.000	0	0	0.000	0	0.000	0.000

Reference states: Ga(liquid), Pb(liquid)

Table IIIb. Partial quantities for Ga in the liquid phase at 923 K.

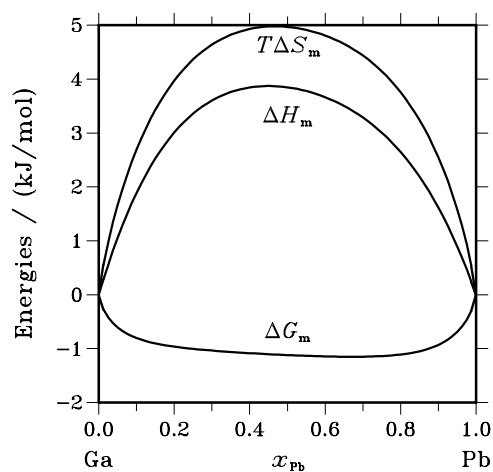
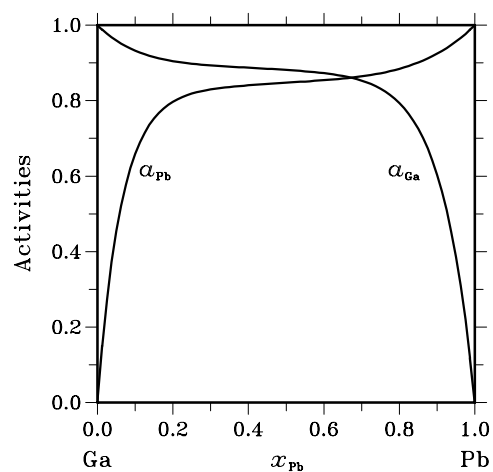
x_{Ga}	ΔG_{Ga} [J/mol]	ΔH_{Ga} [J/mol]	ΔS_{Ga} [J/(mol·K)]	G_{Ga}^{E} [J/mol]	S_{Ga}^{E} [J/(mol·K)]	a_{Ga}	γ_{Ga}
1.000	0	0	0.000	0	0.000	1.000	1.000
0.900	−536	426	1.042	272	0.166	0.933	1.036
0.800	−768	1359	2.305	944	0.450	0.905	1.131
0.700	−865	2420	3.559	1872	0.594	0.893	1.276
0.600	−918	3412	4.691	3002	0.444	0.887	1.479
0.500	−969	4319	5.729	4351	−0.034	0.881	1.763
0.400	−1045	5310	6.884	5987	−0.734	0.873	2.182
0.300	−1219	6733	8.615	8020	−1.395	0.853	2.844
0.200	−1773	9122	11.803	10578	−1.578	0.794	3.969
0.100	−3878	13191	18.492	13793	−0.653	0.603	6.033
0.000	−∞	19837	∞	17784	2.224	0.000	10.148

Reference state: Ga(liquid)

Table IIIc. Partial quantities for Pb in the liquid phase at 923 K.

x_{Pb}	ΔG_{Pb} [J/mol]	ΔH_{Pb} [J/mol]	ΔS_{Pb} [J/(mol·K)]	G_{Pb}^{E} [J/mol]	S_{Pb}^{E} [J/(mol·K)]	a_{Pb}	γ_{Pb}
0.000	−∞	23611	∞	19869	4.054	0.000	13.317
0.100	−3199	15025	19.744	14471	0.599	0.659	6.591
0.200	−1739	9605	12.290	10612	−1.091	0.797	3.986
0.300	−1434	6363	8.447	7806	−1.563	0.830	2.765
0.400	−1333	4494	6.314	5699	−1.305	0.841	2.101
0.500	−1271	3376	5.034	4049	−0.729	0.847	1.695
0.600	−1210	2567	4.091	2710	−0.156	0.854	1.424
0.700	−1119	1809	3.172	1619	0.206	0.864	1.235
0.800	−943	1027	2.134	770	0.279	0.884	1.105
0.900	−602	328	1.008	206	0.132	0.925	1.027
1.000	0	0	0.000	0	0.000	1.000	1.000

Reference state: Pb(liquid)

Fig. 2. Integral quantities of the liquid phase at $T=923$ K.Fig. 3. Activities in the liquid phase at $T=923$ K.

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