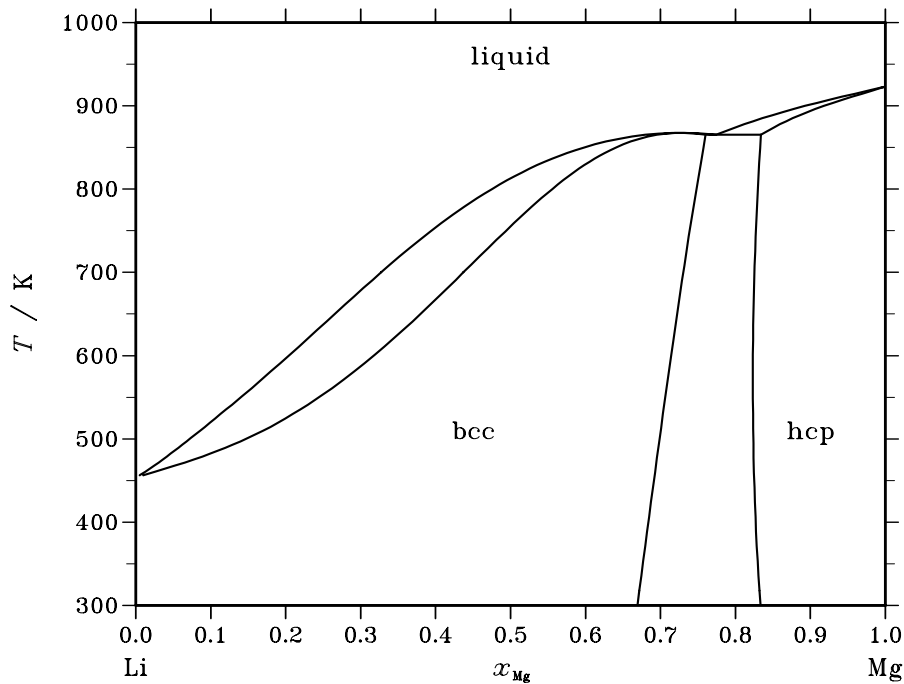


Li – Mg (Lithium – Magnesium)**Fig. 1.** Calculated phase diagram for the system Li-Mg.

Lithium and magnesium are important constituents for light metal alloys. The combination of both metals is encountered in magnesium alloys as well as in aluminium alloys. Several reviews and thermodynamic assessments of the Li-Mg system have been published [84Nay, 90Sau, 96Gas]. The assessment of Saunders [90Sau] is selected here, because it provides a good description of the experimental data for the binary system Li-Mg and it has been successfully incorporated into a larger databases for light metal alloys [98Ans]. The optimisation [90Sau] takes into account data for the phase diagram from several investigations, heats of mixing in the liquid at 940 K and activity data for Li in the liquid in the range 670-887 K. More recent results from EMF investigations [96Gas] show slight deviations from the calculated [90Sau] values.

Table I. Phases, structures and models.

Phase	Strukturbericht	Prototype	Pearson symbol	Space group	SGTE name	Model
liquid					LIQUID	(Li,Mg) ₁
bcc	A2	W	<i>cI2</i>	<i>Im$\bar{3}m$</i>	BCC_A2	(Li,Mg) ₁
hcp	A3	Mg	<i>hP2</i>	<i>P6₃/mmc</i>	HCP_A3	(Li,Mg) ₁

Table II. Invariant reactions.

Reaction	Type	<i>T</i> / K	Compositions / <i>x</i> _{Mg}			$\Delta_r H$ / (J/mol)
liquid \rightleftharpoons bcc	congruent	867.4	0.728	0.728		–5969
liquid \rightleftharpoons bcc + hcp	eutectic	865.2	0.774	0.760	0.834	–6236

Table IIIa. Integral quantities for the liquid phase at 940 K.

x_{Mg}	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	−3045	−1097	2.073	−504	−0.630	0.000
0.200	−4795	−2185	2.777	−884	−1.384	0.000
0.300	−5915	−3067	3.030	−1141	−2.049	0.000
0.400	−6537	−3608	3.116	−1277	−2.480	0.000
0.500	−6714	−3734	3.170	−1297	−2.593	0.000
0.600	−6468	−3436	3.226	−1208	−2.370	0.000
0.700	−5795	−2767	3.222	−1021	−1.857	0.000
0.800	−4658	−1842	2.996	−747	−1.164	0.000
0.900	−2942	−839	2.237	−401	−0.466	0.000
1.000	0	0	0.000	0	0.000	0.000

Reference states: Li(liquid), Mg(liquid)

Table IIIb. Partial quantities for Li in the liquid phase at 940 K.

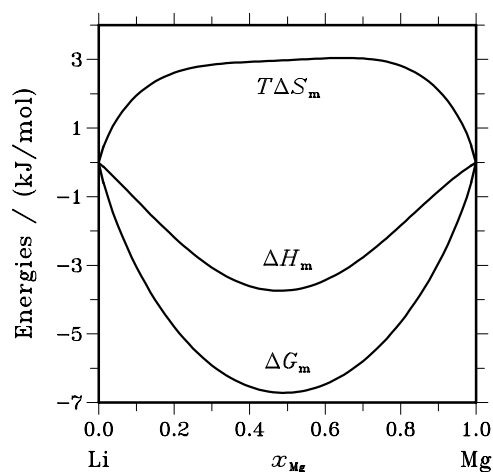
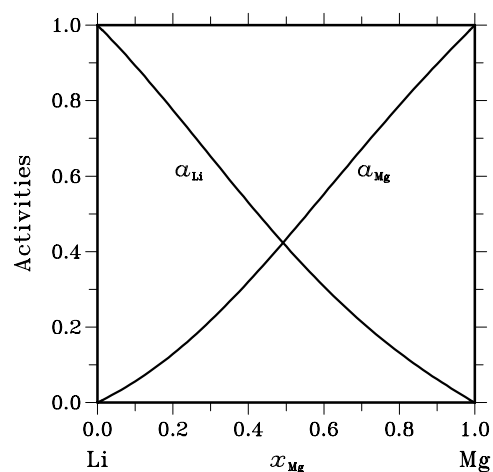
x_{Li}	ΔG_{Li} [J/mol]	ΔH_{Li} [J/mol]	ΔS_{Li} [J/(mol·K)]	G_{Li}^{E} [J/mol]	S_{Li}^{E} [J/(mol·K)]	a_{Li}	γ_{Li}
1.000	0	0	0.000	0	0.000	1.000	1.000
0.900	−885	34	0.978	−62	0.102	0.893	0.992
0.800	−1992	−159	1.950	−248	0.095	0.775	0.969
0.700	−3342	−881	2.618	−555	−0.348	0.652	0.932
0.600	−4962	−2247	2.889	−970	−1.359	0.530	0.883
0.500	−6893	−4181	2.885	−1475	−2.878	0.414	0.828
0.400	−9207	−6422	2.964	−2046	−4.655	0.308	0.770
0.300	−12059	−8518	3.767	−2649	−6.243	0.214	0.712
0.200	−15825	−9831	6.377	−3246	−7.005	0.132	0.660
0.100	−21787	−9535	13.034	−3791	−6.111	0.062	0.616
0.000	−∞	−6613	∞	−4229	−2.537	0.000	0.582

Reference state: Li(liquid)

Table IIIc. Partial quantities for Mg in the liquid phase at 940 K.

x_{Mg}	ΔG_{Mg} [J/mol]	ΔH_{Mg} [J/mol]	ΔS_{Mg} [J/(mol·K)]	G_{Mg}^{E} [J/mol]	S_{Mg}^{E} [J/(mol·K)]	a_{Mg}	γ_{Mg}
0.000	−∞	−10191	∞	−5658	−4.823	0.000	0.485
0.100	−22481	−11274	11.923	−4485	−7.222	0.056	0.563
0.200	−16008	−10289	6.084	−3429	−7.298	0.129	0.645
0.300	−11919	−8167	3.991	−2509	−6.019	0.218	0.725
0.400	−8899	−5649	3.457	−1737	−4.161	0.320	0.801
0.500	−6535	−3287	3.456	−1118	−2.307	0.433	0.867
0.600	−4642	−1445	3.401	−650	−0.847	0.552	0.920
0.700	−3111	−302	2.988	−323	0.023	0.672	0.960
0.800	−1866	156	2.151	−122	0.296	0.788	0.984
0.900	−848	127	1.038	−25	0.162	0.897	0.997
1.000	0	0	0.000	0	0.000	1.000	1.000

Reference state: Mg(liquid)

**Fig. 2.** Integral quantities of the liquid phase at $T=940$ K.**Fig. 3.** Activities in the liquid phase at $T=940$ K.**Table IVa.** Integral quantities for the stable phases at 450 K.

Phase	x_{Mg}	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)]
bcc	0.000	0	0	0.000	0	0.000	0.000
	0.100	-1906	-936	2.155	-690	-0.548	0.000
	0.200	-3279	-1826	3.229	-1407	-0.932	0.000
	0.300	-4307	-2539	3.930	-2022	-1.149	0.000
	0.400	-4947	-2968	4.399	-2429	-1.197	0.000
	0.500	-5145	-3034	4.691	-2551	-1.073	0.000
	0.600	-4851	-2682	4.819	-2333	-0.777	0.000
	0.691	-4124	-1971	4.782	-1811	-0.357	0.000
hcp	0.825	-2726	-1148	3.505	-991	-0.350	0.000
	0.900	-1816	-690	2.503	-600	-0.200	0.000
	1.000	0	0	0.000	0	0.000	0.000

Reference states: Li(bcc), Mg(hcp)

Table IVb. Partial quantities for Li in the stable phases at 450 K.

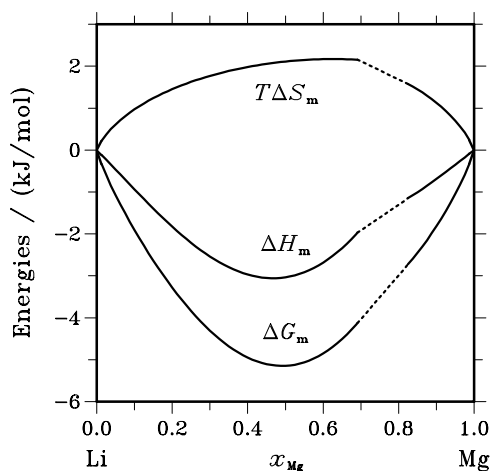
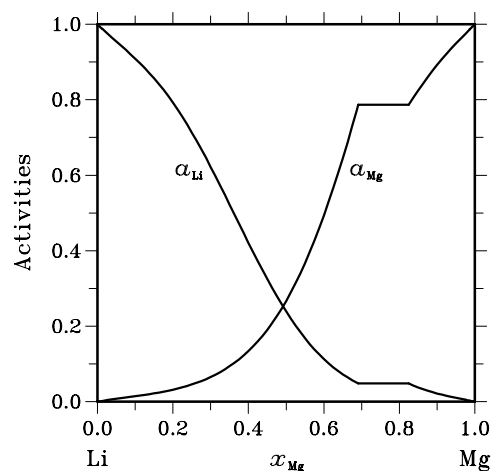
Phase	x_{Li}	ΔG_{Li} [J/mol]	ΔH_{Li} [J/mol]	ΔS_{Li} [J/(mol·K)]	G_{Li}^{E} [J/mol]	S_{Li}^{E} [J/(mol·K)]	a_{Li}	γ_{Li}
bcc	1.000	0	0	0.000	0	0.000	1.000	1.000
	0.900	-357	1	0.795	37	-0.081	0.909	1.010
	0.800	-871	-185	1.526	-37	-0.329	0.792	0.990
	0.700	-1777	-780	2.215	-442	-0.751	0.622	0.889
	0.600	-3237	-1933	2.898	-1326	-1.349	0.421	0.702
	0.500	-5352	-3714	3.641	-2758	-2.123	0.239	0.478
	0.400	-8164	-6117	4.551	-4736	-3.068	0.113	0.282
	0.309	-11348	-8784	5.697	-6950	-4.074	0.048	0.156
hcp	0.175	-11348	-5726	12.493	-4826	-2.000	0.048	0.275
	0.100	-14330	-6615	17.145	-5715	-2.000	0.022	0.217
	0.000	$-\infty$	-7010	∞	-6110	-2.000	0.000	0.195

Reference state: Li(bcc)

Table IVc. Partial quantities for Mg in the stable phases at 450 K.

Phase	x_{Mg}	ΔG_{Mg} [J/mol]	ΔH_{Mg} [J/mol]	ΔS_{Mg} [J/(mol·K)]	G_{Mg}^{E} [J/mol]	S_{Mg}^{E} [J/(mol·K)]	a_{Mg}	γ_{Mg}
bcc	0.000	$-\infty$	−9096	∞	−6272	−6.276	0.000	0.187
	0.100	−15850	−9371	14.398	−7234	−4.747	0.014	0.145
	0.200	−12911	−8393	10.039	−6889	−3.342	0.032	0.159
	0.300	−10212	−6642	7.932	−5707	−2.078	0.065	0.218
	0.400	−7513	−4520	6.651	−4085	−0.968	0.134	0.336
	0.500	−4937	−2354	5.741	−2344	−0.022	0.267	0.534
	0.600	−2641	−392	4.998	−730	0.751	0.494	0.823
	0.691	−897	1071	4.374	485	1.304	0.787	1.138
hcp	0.825	−897	−177	1.599	−177	0.000	0.787	0.954
	0.900	−426	−32	0.876	−32	0.000	0.892	0.992
	1.000	0	0	0.000	0	0.000	1.000	1.000

Reference state: Mg(hcp)

**Fig. 4.** Integral quantities of the stable phases at $T=450$ K.**Fig. 5.** Activities in the stable phases at $T=450$ K.

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