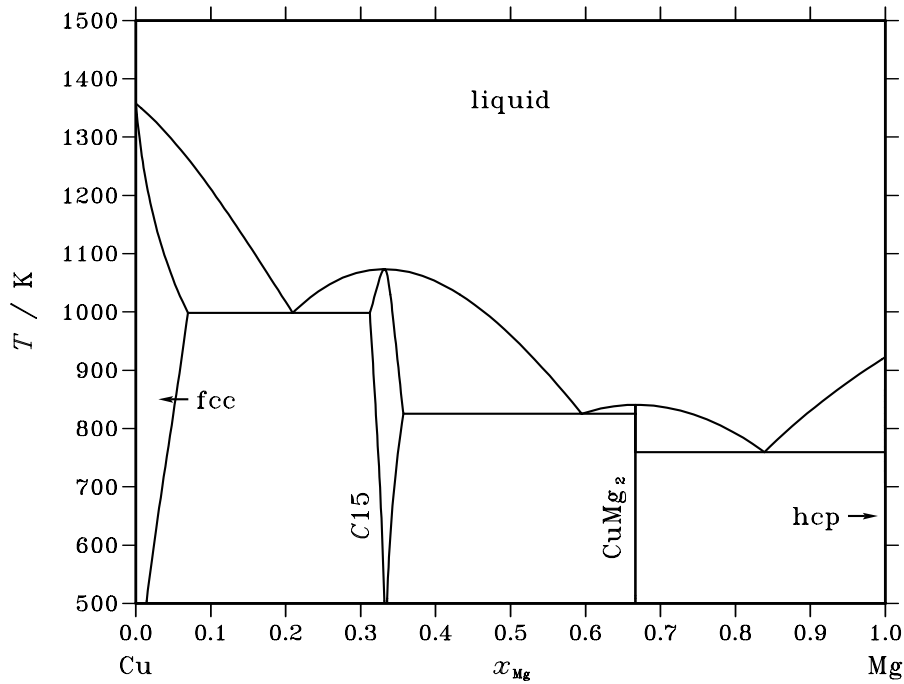


Cu – Mg (Copper – Magnesium)**Fig. 1.** Calculated phase diagram for the system Cu-Mg.

The copper-magnesium system is part of Al-Cu-Mg-Zn which has been investigated in the framework of the COST 507 program on light metal alloys. The selected assessment has been performed by Coughanowr *et al.* [91Cou]. The experimental data has been critically reviewed by Nayeb-Hashemi and Clark [84Nay]. Two congruent melting intermetallic compounds are known in the system: stoichiometric CuMg_2 and the cubic Laves phase Cu_2Mg (C15) which has a homogeneity range of a few at.%. The solubility of Cu in solid Mg is negligible and an experimental value of 0.013 at.% Cu is given at the eutectic $\text{liquid} \rightleftharpoons \text{CuMg}_2 + \text{hcp}$. The maximum solubility of Mg in solid Cu is 6.9 at.% Mg at the eutectic $\text{liquid} \rightleftharpoons \text{fcc} + \text{C15}$. The assessment is in good agreement with the experimental liquidus and the invariant points as determined by Jones [31Jon] and Bagnoud *et al.* [78Bag] and all the thermodynamic data cited in [84Nay].

Table I. Phases, structures and models.

Phase	Struktur- bericht	Prototype	Pearson symbol	Space group	SGTE name	Model
liquid					LIQUID	$(\text{Cu}, \text{Mg})_1$
fcc	A1	Cu	$cF4$	$Fm\bar{3}m$	FCC_A1	$(\text{Cu}, \text{Mg})_1$
C15	C15	Cu_2Mg	$cF24$	$Fd\bar{3}m$	LAVES_C15	$(\text{Cu}, \text{Mg})_2(\text{Cu}, \text{Mg})_1$
CuMg_2	C_b	CuMg_2	$oF48$	$Fddd$	CUMG2	Cu_1Mg_2
hcp	A3	Mg	$hP2$	$P6_3/mmc$	HCP_A3	$(\text{Cu}, \text{Mg})_1$

Table II. Invariant reactions.

Reaction	Type	T / K	Compositions / x_{Mg}			$\Delta_r H / (\text{J/mol})$
liquid $\rightleftharpoons C15$	congruent	1073.5	0.331	0.331		–12520
liquid $\rightleftharpoons \text{fcc} + C15$	eutectic	998.6	0.209	0.070	0.312	–11056
liquid $\rightleftharpoons \text{CuMg}_2$	congruent	840.8	0.667	0.667		–11821
liquid $\rightleftharpoons C15 + \text{CuMg}_2$	eutectic	825.5	0.595	0.357	0.667	–11386
liquid $\rightleftharpoons \text{CuMg}_2 + \text{hcp}$	eutectic	759.7	0.839	0.667	1.000	–9385

Table IIIa. Integral quantities for the liquid phase at 1400 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	–7102	–3916	2.276	–3318	–0.427	0.000
0.200	–11462	–6700	3.402	–5637	–0.759	0.000
0.300	–14165	–8449	4.083	–7055	–0.996	0.000
0.400	–15504	–9264	4.457	–7670	–1.139	0.000
0.500	–15649	–9241	4.577	–7580	–1.186	0.000
0.600	–14718	–8478	4.457	–6884	–1.139	0.000
0.700	–12791	–7075	4.083	–5680	–0.996	0.000
0.800	–9891	–5129	3.402	–4066	–0.759	0.000
0.900	–5924	–2738	2.276	–2140	–0.427	0.000
1.000	0	0	0.000	0	0.000	0.000

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

Table IIIb. Partial quantities for Cu in the liquid phase at 1400 K.

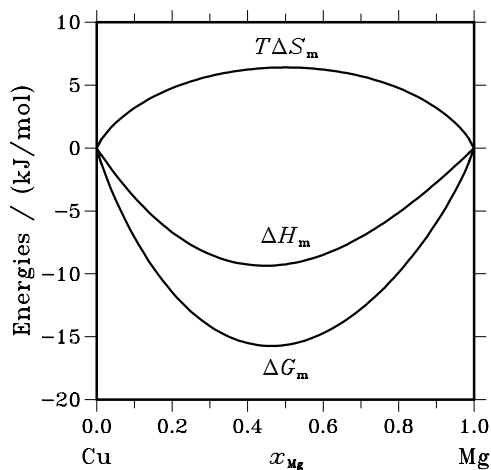
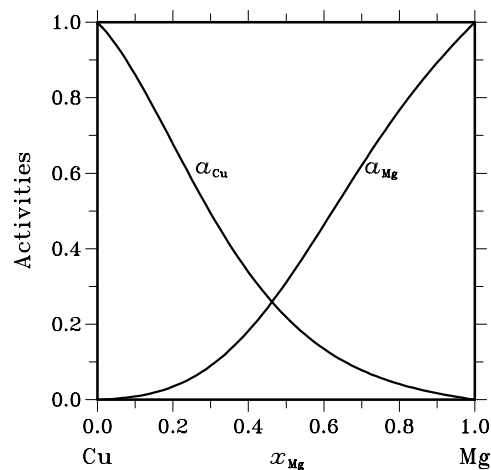
x_{Cu}	ΔG_{Cu} [J/mol]	ΔH_{Cu} [J/mol]	ΔS_{Cu} [J/(mol·K)]	G_{Cu}^{E} [J/mol]	S_{Cu}^{E} [J/(mol·K)]	a_{Cu}	γ_{Cu}
1.000	0	0	0.000	0	0.000	1.000	1.000
0.900	–1742	–582	0.829	–516	–0.047	0.861	0.957
0.800	–4530	–2199	1.666	–1933	–0.190	0.678	0.847
0.700	–8206	–4652	2.539	–4054	–0.427	0.494	0.706
0.600	–12630	–7747	3.488	–6684	–0.759	0.338	0.563
0.500	–17694	–11286	4.577	–9626	–1.186	0.219	0.437
0.400	–23349	–15074	5.911	–12683	–1.708	0.135	0.336
0.300	–29674	–18914	7.686	–15659	–2.325	0.078	0.260
0.200	–37093	–22609	10.346	–18358	–3.036	0.041	0.207
0.100	–47386	–25963	15.302	–20584	–3.843	0.017	0.171
0.000	– ∞	–28781	∞	–22139	–4.744	0.000	0.149

Reference state: Cu(liquid)

Table IIIc. Partial quantities for Mg in the liquid phase at 1400 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	$-\infty$	−45145	∞	−38503	−4.744	0.000	0.037
0.100	−55340	−33916	15.302	−28537	−3.843	0.009	0.086
0.200	−39187	−24704	10.346	−20453	−3.036	0.035	0.173
0.300	−28070	−17310	7.686	−14056	−2.325	0.090	0.299
0.400	−19814	−11539	5.911	−9148	−1.708	0.182	0.456
0.500	−13603	−7195	4.577	−5535	−1.186	0.311	0.622
0.600	−8965	−4081	3.488	−3019	−0.759	0.463	0.772
0.700	−5555	−2001	2.539	−1403	−0.427	0.620	0.886
0.800	−3090	−758	1.666	−493	−0.190	0.767	0.959
0.900	−1317	−157	0.829	−90	−0.047	0.893	0.992
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 $T=1400$ K.**Fig. 3.** Activities in the liquid phase at $T=1400$ K.**Table IV.** Standard reaction quantities at 298.15 K for the compounds per mole of atoms.

Compound	x_{Mg}	$\Delta_f G^\circ$ / (J/mol)	$\Delta_f H^\circ$ / (J/mol)	$\Delta_f S^\circ$ / (J/(mol·K))	$\Delta_f C_P^\circ$ / (J/(mol·K))
C15	0.333	−11278	−10908	1.241	−1.432
Cu ₁ Mg ₂	0.667	−9355	−9540	−0.622	0.000

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