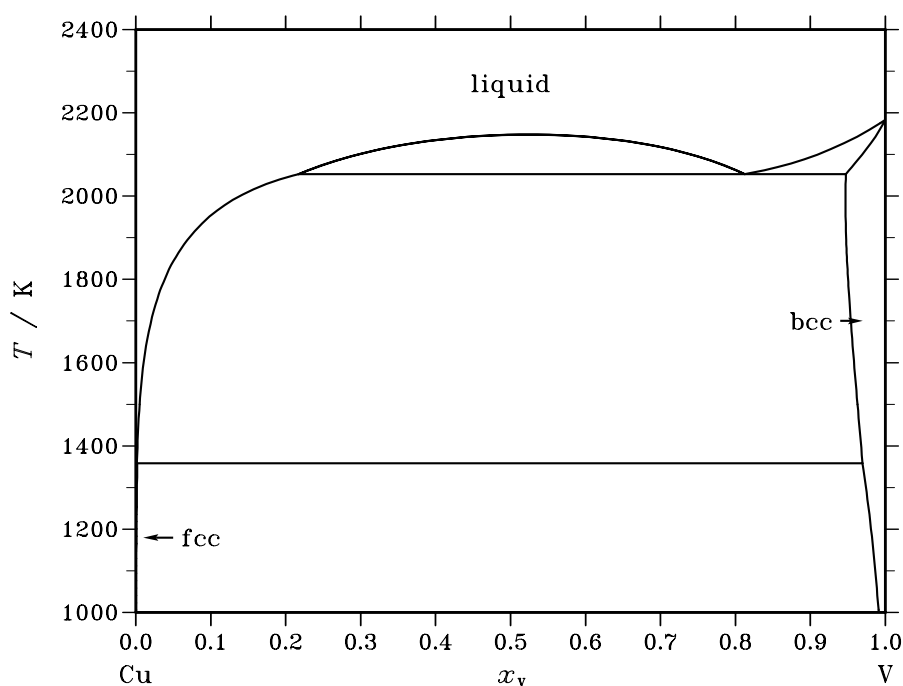


Cu – V (Copper – Vanadium)**Fig. 1.** Calculated phase diagram for the system Cu-V.

The data for the Cu-V system were critically assessed by B.-J. Lee [99Lee]. This system shows a wide range of immiscibility in the liquid phase up to ~ 2150 K corresponding to a composition of 50 at.% V. A monotectic reaction occurs at 2051 K, where the Cu-rich liquid contains about 84 at.% Cu and the V-rich liquid ~ 18.5 at.% Cu [77All]. All experimental studies indicate quite limited terminal solubility on the Cu-rich side as determined by X-ray studies and microscopy. With decreasing temperature the solubility of V in fcc-Cu decreases reaching a composition near 0.1 at.% V at room temperature. The solubility of Cu in bcc-V above 1873 K was determined by [77All] and [69Ste], the experimental data show good consistency. The peritectic point reported by Savitskii [64Sav] occurs at 99.2 at.% Cu and 1393 K in equilibrium with a liquidus of 96.6 at.% Cu. Later investigations [77All, 69Ste] found the peritectic temperature at 1358 K, only a few degrees above the melting point of Cu. Gachon *et al.* [80Gac] carried out thermodynamic measurements of the Gibbs energies of formation for dilute V-rich solutions. The experimental phase diagram data are well represented by the calculated phase equilibria.

Table I. Phases, structures and models.

Phase	Struktur- bericht	Prototype	Pearson symbol	Space group	SGTE name	Model
liquid					LIQUID	(Cu,V) ₁
fcc	A1	Cu	<i>cF4</i>	<i>Fm$\bar{3}m$</i>	FCC_A1	(Cu,V) ₁
bcc	A2	W	<i>cI2</i>	<i>Im$\bar{3}m$</i>	BCC_A2	(Cu,V) ₁

Table II. Invariant reactions.

Reaction	Type	T / K	Compositions / x_V			$\Delta_r H / (\text{J/mol})$
liquid \rightleftharpoons liquid' + liquid''	critical	2147.4	0.524	0.524	0.524	0
liquid' \rightleftharpoons liquid'' + bcc	monotectic	2052.7	0.812	0.217	0.947	–30008
liquid' + bcc \rightleftharpoons fcc	peritectic	1358.1	0.002	0.970	0.002	–13335

Table IIIa. Integral quantities for the liquid phase at 2200 K.

x_V	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	–3003	10565	6.167	2944	3.464	0.000
0.200	–3883	18819	10.319	5270	6.158	0.000
0.300	–4209	24747	13.162	6964	8.083	0.000
0.400	–4297	28337	14.833	8014	9.238	0.000
0.500	–4274	29575	15.386	8405	9.623	0.000
0.600	–4188	28446	14.833	8123	9.238	0.000
0.700	–4018	24938	13.162	7156	8.083	0.000
0.800	–3665	19037	10.319	5488	6.158	0.000
0.900	–2839	10729	6.167	3108	3.464	0.000
1.000	0	0	0.000	0	0.000	0.000

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

Table IIIb. Partial quantities for Cu in the liquid phase at 2200 K.

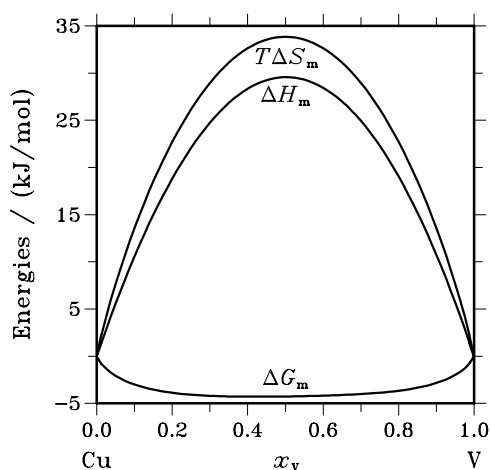
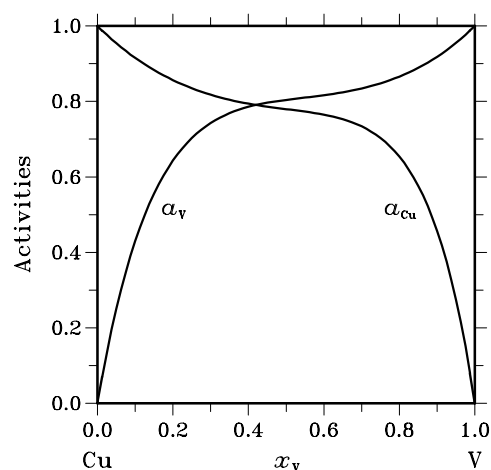
x_{Cu}	ΔG_{Cu} [J/mol]	ΔH_{Cu} [J/mol]	ΔS_{Cu} [J/(mol·K)]	G_{Cu}^E [J/mol]	S_{Cu}^E [J/(mol·K)]	a_{Cu}	γ_{Cu}
1.000	0	0	0.000	0	0.000	1.000	1.000
0.900	–1621	1153	1.261	307	0.385	0.915	1.017
0.800	–2837	4632	3.395	1245	1.540	0.856	1.070
0.700	–3683	10463	6.430	2841	3.464	0.818	1.168
0.600	–4220	18673	10.406	5124	6.158	0.794	1.323
0.500	–4559	29290	15.386	8120	9.623	0.779	1.559
0.400	–4904	42342	21.475	11857	13.857	0.765	1.912
0.300	–5661	57855	28.871	16362	18.860	0.734	2.446
0.200	–7778	75856	38.016	21662	24.634	0.654	3.268
0.100	–14335	96374	50.322	27784	31.177	0.457	4.567
0.000	– ∞	119435	∞	34756	38.491	0.000	6.686

Reference state: Cu(liquid)

Table IIIc. Partial quantities for V in the liquid phase at 2200 K.

x_V	ΔG_V [J/mol]	ΔH_V [J/mol]	ΔS_V [J/(mol·K)]	G_V^E [J/mol]	S_V^E [J/(mol·K)]	a_V	γ_V
0.000	$-\infty$	117161	∞	32482	38.491	0.000	5.905
0.100	-15440	95269	50.322	26679	31.177	0.430	4.299
0.200	-8069	75565	38.016	21371	24.634	0.643	3.217
0.300	-5438	58078	28.871	16585	18.860	0.743	2.476
0.400	-4412	42833	21.475	12349	13.857	0.786	1.964
0.500	-3990	29859	15.386	8689	9.623	0.804	1.608
0.600	-3710	19183	10.406	5634	6.158	0.816	1.361
0.700	-3314	10831	6.430	3210	3.464	0.834	1.192
0.800	-2637	4832	3.395	1445	1.540	0.866	1.082
0.900	-1561	1213	1.261	366	0.385	0.918	1.020
1.000	0	0	0.000	0	0.000	1.000	1.000

Reference state: V(liquid)

**Fig. 2.** Integral quantities of the liquid phase at $T=2200$ K.**Fig. 3.** Activities in the liquid phase at $T=2200$ K.

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