C – Rh (Carbon – Rhodium)

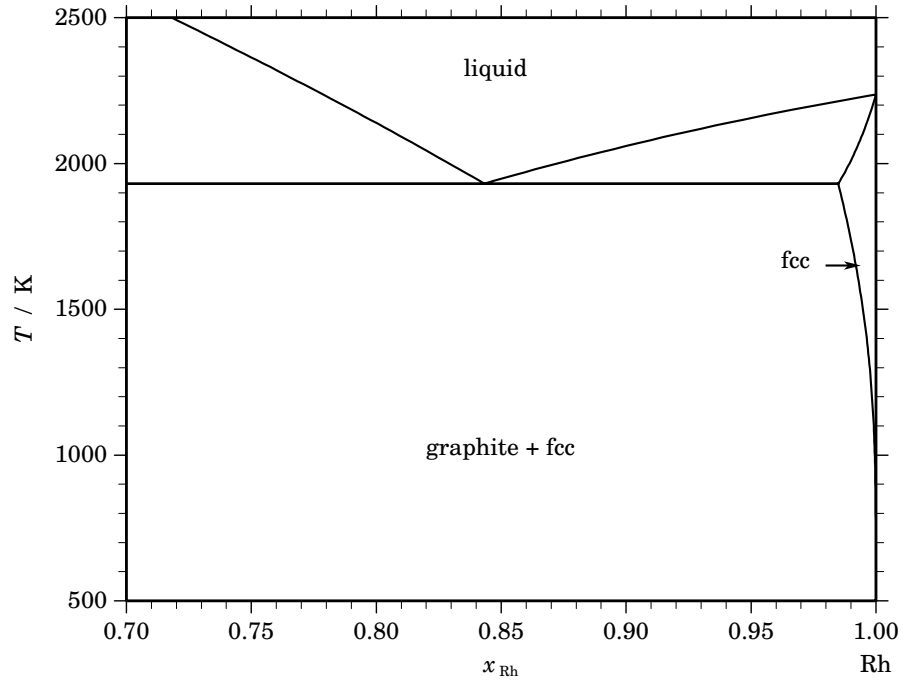

Fig. 1. Calculated phase diagram for the system C-Rh.

The C-Rh phase diagram is eutectic and includes the liquid phase, the fcc phase based on Rh and graphite [1990Mas]. Experimental data on the C-Rh system are limited and as the basis for the optimisation the phase diagram data given in [1990Mas] and the experimental data about the eutectic temperature [2004Din] are used. The solubility ranges for C in fcc-Rh were investigated by Barabash and Koval [1986Bar] in the temperature range from 1073 to 1523 K. The invariant equilibrium experimental data have been determined by Nadler and Kempter [1960Nad] who reported the eutectic temperature 1967±17 K, by Bhatt and Venkataramani (1947 K) [1987Bha] and by Dinsdale (1930 K) [2004Din]. The experimental investigations are in reasonable agreement, except for the eutectic temperature. The most recent measurement [2004Din] was used in the data assessment. The C-Rh system has been critically assessed by Korb and Jantzen [2004Kor]. The calculated and experimental [1967Gie, 2004Din] phase diagram are in good agreement.

Table I. Phases, structures and models.

Phase	Struktur-bericht	Prototype	Pearson symbol	Space group	SGTE name	Model
liquid					LIQUID	$(C,Rh)_1$
graphite	$A9$	C(graphite)	$hP4$	$P6_3/mmc$	GRAPHITE	C_1
fcc	$A1$	Cu	$cF4$	$Fm\overline{3}m$	FCC_A1	$Rh_1(C,\Box)_1$

Table II. Invariant reactions.

Reaction	Type	T / K	Compositions / x_{Rh}			$\Delta_r H$ / (J/mol)
liquid $\rightleftharpoons$ graphite + fcc	eutectic	1931.0	0.843	0.000	0.985	−30031

Table IIIa. Integral quantities for the liquid phase at 2250 K.

x_{Rh}	ΔG_{m} [J/mol]	ΔH_{m} [J/mol]	ΔS_{m} [J/(mol·K)]	$G_{\mathrm{m}}^{\mathrm{E}}$ [J/mol]	$S_{\mathrm{m}}^{\mathrm{E}}$ [J/(mol·K)]	ΔC_P [J/(mol·K)]
0.776	−5313	14560	8.832	4643	4.408	0.000
0.800	−5420	12660	8.035	3941	3.875	0.000
0.900	−4507	5652	4.515	1575	1.812	0.000
1.000	0	0	0.000	0	0.000	0.000

Reference states: C(graphite), Rh(liquid)

Table IIIb. Partial quantities for C in the liquid phase at 2250 K.

x_{C}	ΔG_{C} [J/mol]	ΔH_{C} [J/mol]	ΔS_{C} [J/(mol·K)]	$G_{\mathrm{C}}^{\mathrm{E}}$ [J/mol]	$S_{\mathrm{C}}^{\mathrm{E}}$ [J/(mol·K)]	a_{C}	γ_{C}
0.224	0	76727	34.101	27971	21.669	1.000	4.460
0.200	−3836	74143	34.657	26273	21.276	0.815	4.073
0.100	−23898	62622	38.453	19178	19.308	0.279	2.788
0.000	$-\infty$	49732	∞	12087	16.731	0.000	1.908

Reference state: C(graphite)

Table IIIc. Partial quantities for Rh in the liquid phase at 2250 K.

x_{Rh}	ΔG_{Rh} [J/mol]	ΔH_{Rh} [J/mol]	ΔS_{Rh} [J/(mol·K)]	$G_{\mathrm{Rh}}^{\mathrm{E}}$ [J/mol]	$S_{\mathrm{Rh}}^{\mathrm{E}}$ [J/(mol·K)]	a_{Rh}	γ_{Rh}
0.776	−6848	−3407	1.530	−2099	−0.581	0.693	0.894
0.800	−5816	−2711	1.380	−1642	−0.475	0.733	0.916
0.900	−2352	−678	0.744	−381	−0.132	0.882	0.980
1.000	0	0	0.000	0	0.000	1.000	1.000

Reference state: Rh(liquid)

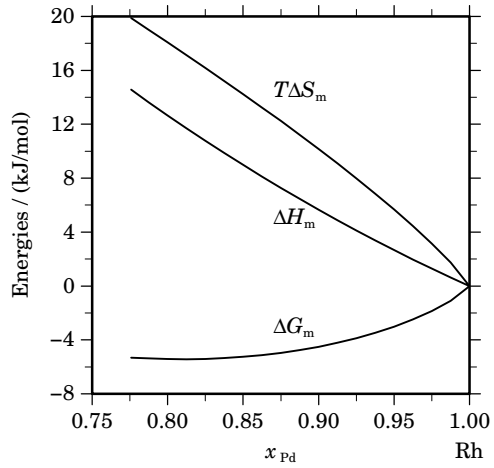

Fig. 2. Integral quantities of the liquid phase at T=2250 K.

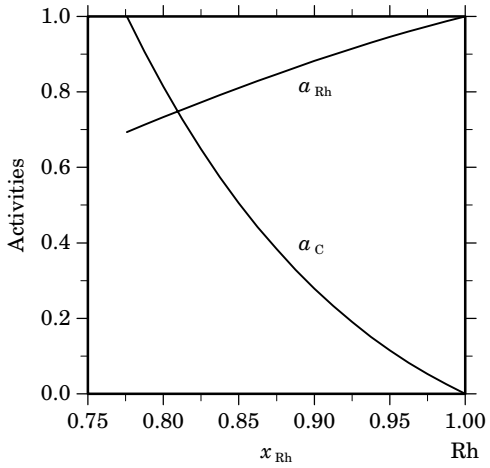

Fig. 3. Activities in the liquid phase at T=2250 K.

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