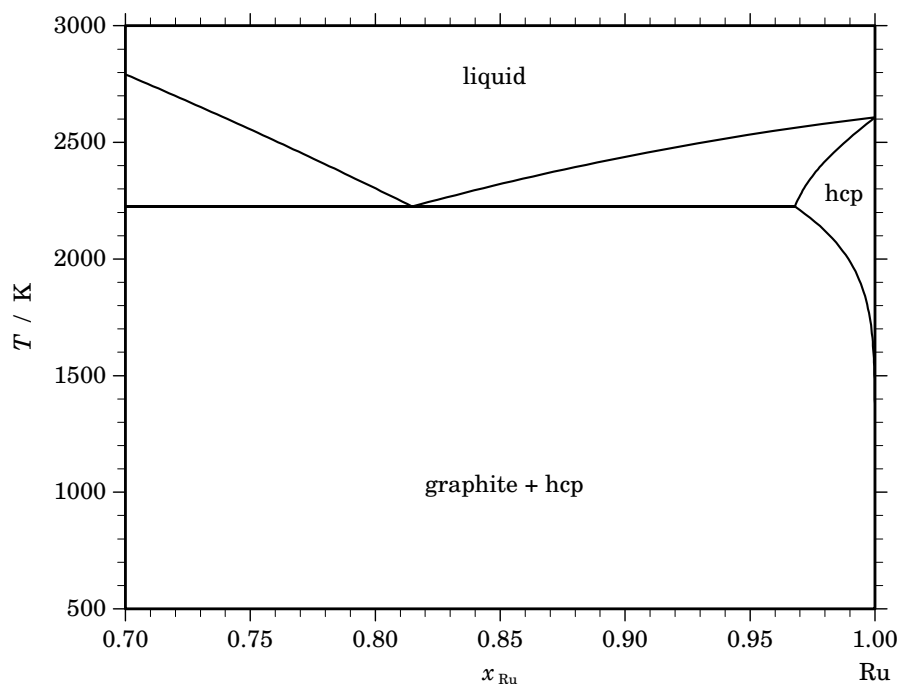


C – Ru (Carbon – Ruthenium)**Fig. 1.** Calculated phase diagram for the system C-Ru.

The C-Ru phase diagram is eutectic and includes the liquid phase, the hcp phase based on Ru and graphite [1990Mas]. The solubility range of C in hcp-Ru was investigated by Barabash and Koval [1986Bar] in the temperature range from 1073 to 1523 K. Experimental data on the C-Ru system are limited. The assessment is based on the phase diagram data given in [1990Mas] which have been measured by Fromm and Gebhardt [1978Fro]. The experimental data for the eutectic temperature are consistent and do not contradict each other. According to Fromm and Gebhardt [1978Fro] the invariant reaction occurs at 2213 K, Bhatt and Venkatarami [1987Bha] reported the temperature 2231 K, while Park and Yamada [2000Par] as well as Dinsdale [2004Din] found the eutectic temperature to be 2225 K. The latter value was used in the data assessment. The C-Ru system has been critically assessed by Korb and Jantzen [2004Kor]. The calculated and experimentally determined phase diagram agree well.

Table I. Phases, structures and models.

| Phase | Struktur- bericht | Prototype | Pearson symbol | Space group | SGTE name | Model |
|----------|----------------------|-------------|-------------------|--------------------------------------|--------------|------------------------------------|
| liquid | | | | | LIQUID | (Ru,C) ₁ |
| graphite | A9 | C(graphite) | <i>hP</i> 4 | <i>P</i> 6 ₃ / <i>mmc</i> | GRAPHITE | C ₁ |
| hcp | A3 | Mg | <i>hP</i> 2 | <i>P</i> 6 ₃ / <i>mmc</i> | HCP_A3 | Ru ₂ (C,□) ₁ |

Table II. Invariant reactions.

| Reaction | Type | <i>T</i> / K | Compositions / <i>x</i> _{Ru} | | | $\Delta_r H$ / (J/mol) |
|--|----------|--------------|---------------------------------------|-------|-------|------------------------|
| liquid \rightleftharpoons graphite + hcp | eutectic | 2225.1 | 0.815 | 0.000 | 0.968 | −38728 |

Table IIIa. Integral quantities for the liquid phase at 2700 K.

| x_{Ru} | 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)] |
|-----------------|----------------------------------|----------------------------------|--------------------------------------|--------------------------------------|--|-----------------------------|
| 0.720 | −8999 | 22946 | 11.831 | 4316 | 6.900 | 0.000 |
| 0.800 | −9227 | 15307 | 9.087 | 2007 | 4.926 | 0.000 |
| 0.900 | −7005 | 6943 | 5.166 | 293 | 2.463 | 0.000 |
| 1.000 | 0 | 0 | 0.000 | 0 | 0.000 | 0.000 |

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

Table IIIb. Partial quantities for C in the liquid phase at 2700 K.

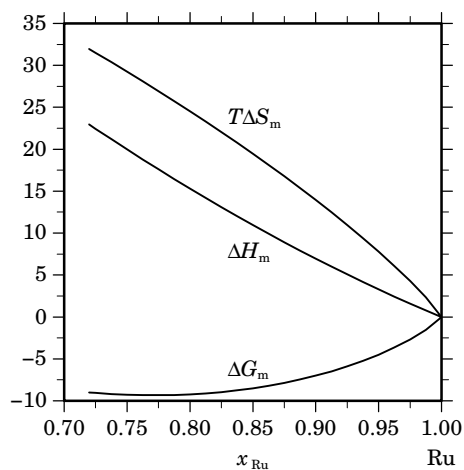
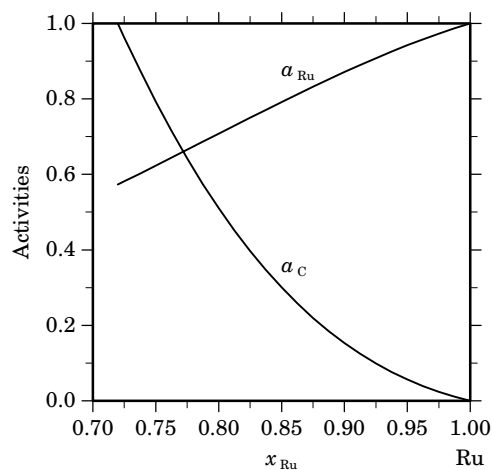
| x_{C} | ΔG_{C} [J/mol] | ΔH_{C} [J/mol] | ΔS_{C} [J/(mol·K)] | G_{C}^{E} [J/mol] | S_{C}^{E} [J/(mol·K)] | a_{C} | γ_{C} |
|----------------|----------------------------------|----------------------------------|--------------------------------------|--------------------------------------|--|----------------|---------------------|
| 0.280 | 0 | 95067 | 35.210 | 28566 | 24.630 | 1.000 | 3.570 |
| 0.200 | −15087 | 87545 | 38.012 | 21044 | 24.630 | 0.511 | 2.553 |
| 0.100 | −42169 | 76024 | 43.775 | 9523 | 24.630 | 0.153 | 1.528 |
| 0.000 | −∞ | 61882 | ∞ | −4619 | 24.630 | 0.000 | 0.814 |

Reference state: C(graphite)

Table IIIc. Partial quantities for Ru in the liquid phase at 2700 K.

| x_{Ru} | ΔG_{Ru} [J/mol] | ΔH_{Ru} [J/mol] | ΔS_{Ru} [J/(mol·K)] | G_{Ru}^{E} [J/mol] | S_{Ru}^{E} [J/(mol·K)] | a_{Ru} | γ_{Ru} |
|-----------------|-----------------------------------|-----------------------------------|---------------------------------------|---------------------------------------|---|-----------------|----------------------|
| 0.720 | −12501 | −5121 | 2.733 | −5121 | 0.000 | 0.573 | 0.796 |
| 0.800 | −7762 | −2753 | 1.855 | −2753 | 0.000 | 0.708 | 0.885 |
| 0.900 | −3098 | −733 | 0.876 | −733 | 0.000 | 0.871 | 0.968 |
| 1.000 | 0 | 0 | 0.000 | 0 | 0.000 | 1.000 | 1.000 |

Reference state: Ru(liquid)

**Fig. 2.** Integral quantities of the liquid phase at $T=2700$ K.**Fig. 3.** Activities in the liquid phase at $T=2700$ K.

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