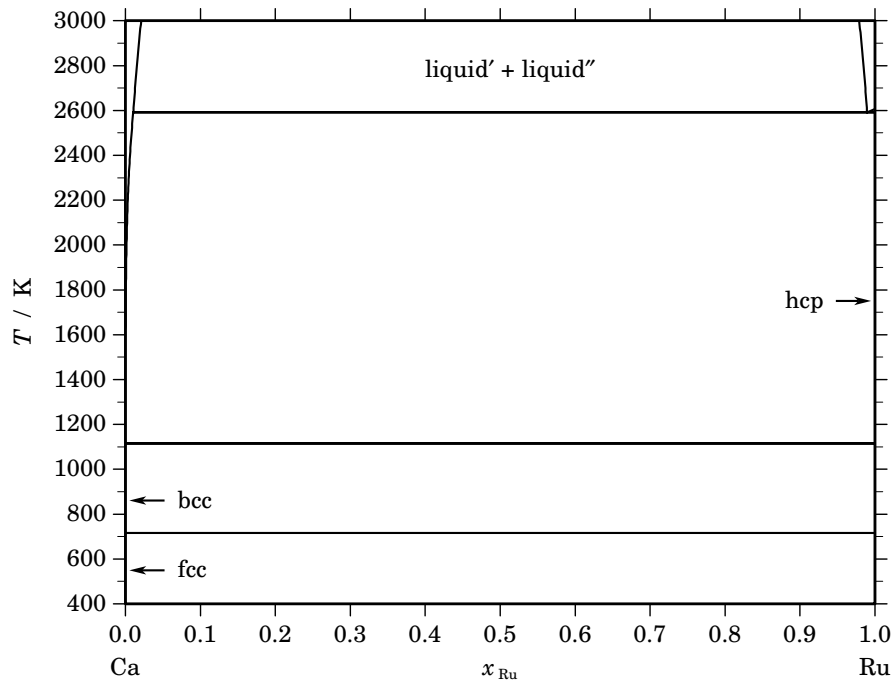


Ca – Ru (Calcium – Ruthenium)**Fig. 1.** Calculated phase diagram for the system Ca-Ru.

The Ca-Ru binary system contains two components of interest in the nuclear field, calcium being a major component of the concrete basemat in its oxide form (CaO) and Ru selected as representative of a family of non-volatile fission products.

The classical compilations of binary phase diagrams, give no information at all on this system. Consequently, it has been supposed that there is a negligible mutual solid solubility of calcium and ruthenium in each other, and a wide miscibility gap in the liquid state, the mutual solubility increasing at high temperature. Thus, the assessed diagram is only qualitative and the solid and liquid solubilities are entirely estimated. No thermodynamic property is available for that system. The system was assessed by Chevalier and Fischer [1996Che].

The excess Gibbs energy of the liquid was estimated to be highly positive, to produce a small solubility of components at low temperature and a large miscibility gap at high temperature. Similarly, highly positive interaction parameters in the bcc, fcc and hcp phases allow to produce a negligible mutual solubility. No comparison of the calculated phase diagram with experimental data is possible.

Table I. Phases, structures and models.

Phase	Struktur- bericht	Prototype	Pearson symbol	Space group	SGTE name	Model
liquid					LIQUID	(Ca,Ru) ₁
fcc	A1	Cu	<i>cF4</i>	<i>Fm$\bar{3}m$</i>	FCC_A1	Ca ₁
bcc	A2	W	<i>cI2</i>	<i>Im$\bar{3}m$</i>	BCC_A2	Ca ₁
hcp	A3	Mg	<i>hP2</i>	<i>P6₃/mmc</i>	HCP_A3	Ru ₁

Table II. Invariant reactions.

Reaction	Type	T / K	Compositions / x_{Ru}			$\Delta_{\text{r}}H / (\text{J/mol})$
liquid \rightleftharpoons liquid + hcp	eutectic	2592.3	0.989	0.011	1.000	–39195
liquid \rightleftharpoons bcc + hcp	eutectic	1115.0	0.000	0.000	1.000	–8540
bcc + hcp \rightleftharpoons fcc	peritectoid	716.0	0.000	1.000	0.000	–929

References

[1996Che] P.-Y. Chevalier, E. Fischer, unpublished work, 1996.