

## Molybdenum – Ruthenium – Uranium

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### Introduction

Very scarce information is available on this system. A partial vertical section in the U rich corner has been reported by [1959Nev] and quoted as “unpublished work by Dwight”. [1959Nev] investigated the system Uranium-Fissium (where “Fissium” is a mixture of fission products the main components of which are just Molybdenum and Ruthenium). Isothermal equilibria in the U rich corner at 600 and 900°C have been have been reported by [1959Chi] as “unpublished information, Metallurgy Division ANL” and, successively, by [1972Iva].

### Solid Phases

Crystallographic data and temperature interval of existence for the solid phases pertinent to the known ternary information are given in Table 1.

### Isothermal Sections

The two partial isothermal sections reported by [1959Chi] and [1972Iva] are shown in Figs. 1 and 2. All equilibria are represented by dashed lines because they have to be considered uncertain. Their consistency with the vertical section reported by [1959Nev] is only approximate.

### Temperature – Composition Sections

The only known temperature-composition section, reported by [1959Nev], is limited to the U rich region. It is shown in Fig. 3, slightly corrected with respect to the original diagram which presented a small phase rule inconsistency. This figure, as the previous ones, has to be considered with care.

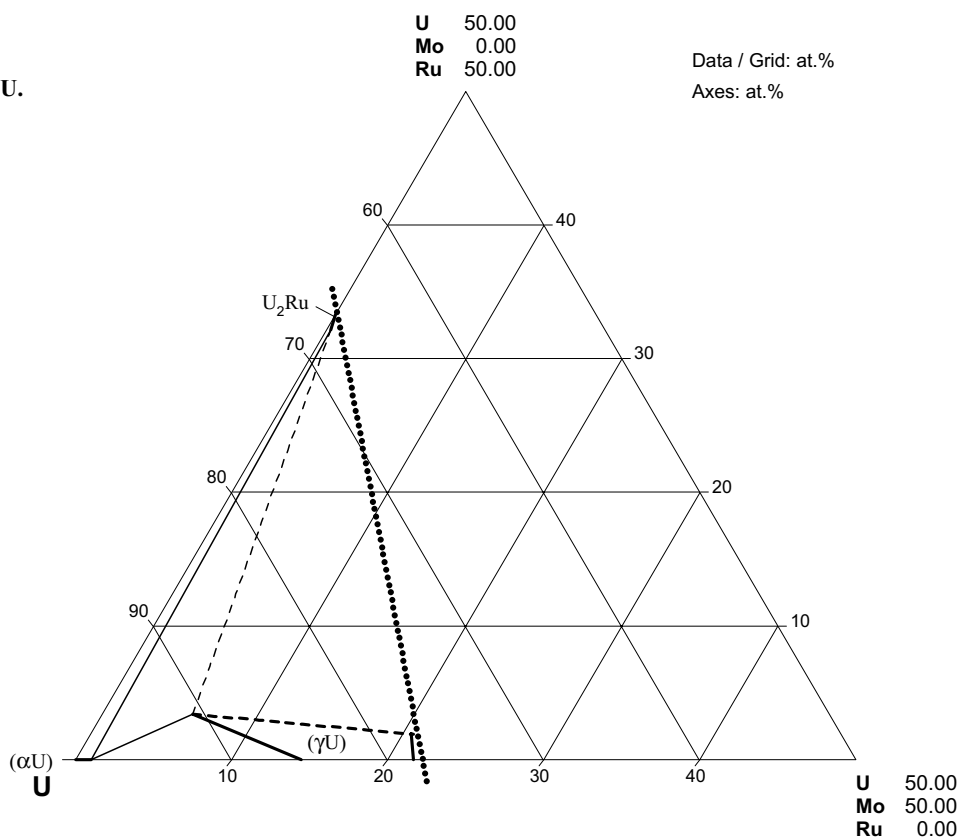
### References

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- [1959Chi] Chiswik, H.H., Dwight, A.E., Lloyd, L.T., Newitt, M.V., Zegler, S.T., “Advances in Physical Metallurgy of Uranium and its Alloys” in “Nuclear Fuel and Reactor Metals”, Proc. 2<sup>nd</sup> Int. Conf. Peaceful Use of Nuclear Energy, Geneve, 1958, (Russian translation), Bochvar, A.A., Emelyanov, B.S. (Eds.), Moscow, 53-82 (1959) (Phase Diagram, Phase Relations, Phys. Prop., Review, 47)
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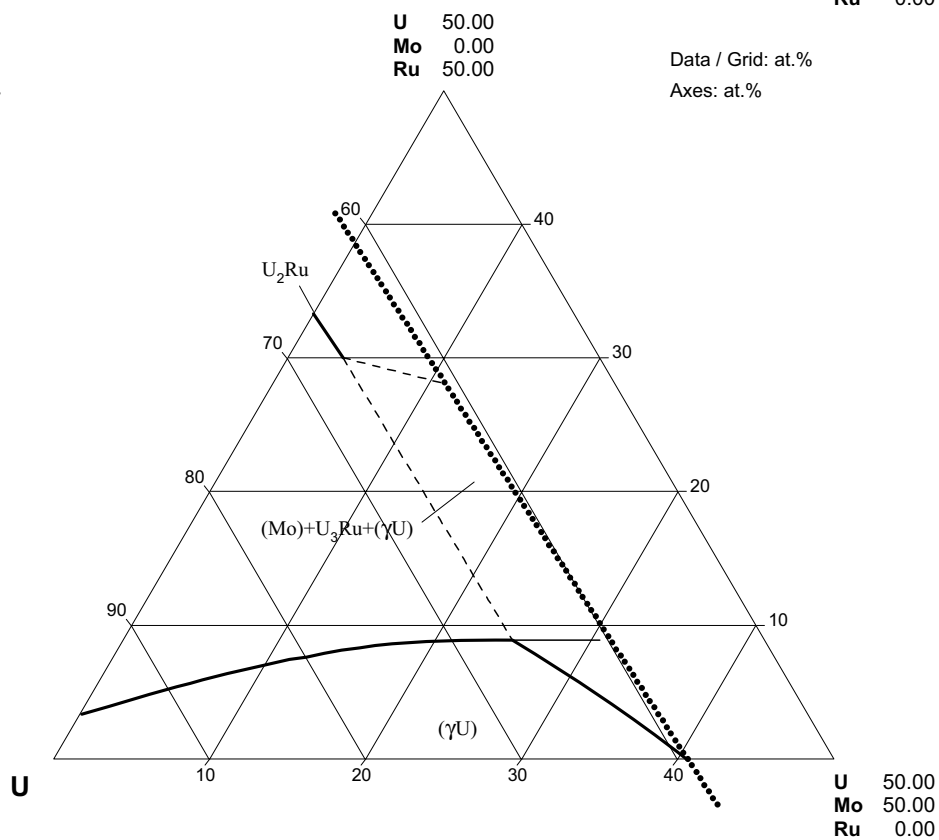
**Table 1:** Crystallographic Data of Solid Phases

Phase/ Temperature Range [°C]	Pearson Symbol/ Space Group/ Prototype	Lattice Parameters [pm]	Comments/References
(Mo) < 2623	<i>cI2</i> <i>Im<math>\bar{3}m</math></i> W	<i>a</i> = 314.70	at 25°C [Mas2]
( $\gamma$ U) 1135 - 776	<i>cI2</i> <i>Im<math>\bar{3}m</math></i> W	<i>a</i> = 352.4	[Mas2]
( $\beta$ U) 776 - 668	<i>tP30</i> <i>P4<sub>2</sub>/mmm</i> $\beta$ U	<i>a</i> = 1075.9 <i>c</i> = 565.6	[Mas2]
( $\alpha$ U) < 668	<i>oC4</i> <i>Cmcm</i> $\alpha$ U	<i>a</i> = 285.37 <i>b</i> = 586.95 <i>c</i> = 495.48	at 25°C [Mas2]
(Ru) < 2334	<i>hP2</i> <i>P6<sub>3</sub>/mmc</i> Mg	<i>a</i> = 270.58 <i>c</i> = 428.16	at 25°C [Mas2]
U <sub>2</sub> Ru < 937	<i>mP12</i> <i>P2/m</i> or <i>P21/m</i> U <sub>2</sub> Ru	<i>a</i> = 1310.6 <i>b</i> = 334.3 <i>c</i> = 520.2 $\beta$ = 96.16°	[V-C2]
MoU <sub>2</sub> < ?	<i>tI16</i> <i>I4/mmm</i> MoSi <sub>2</sub>	<i>a</i> = 342.7 <i>c</i> = 983.4	[V-C2]

**Fig. 1: Mo-Ru-U.**  
Partial isothermal  
section at 600°C



**Fig. 2: Mo-Ru-U.**  
Partial isothermal  
section at 900°C



**Fig. 3: Mo–Ru–U.**  
Partial temperature  
-composition section  
at 1:0.8 Mo:Ru  
weight ratio

