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Crystallographic data on UO_2WO_4 and UO_2MoO_4*.

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Double oxides of uranium with tungsten or molybdenum were prepared by co-calcining mixtures of their oxides in air at temperatures of 800–1000 °C. Only the compounds UO_2WO_4 and UO_2MoO_4 were formed; no other new phases were observed. Reduction of the starting materials or the calcined products at 1700 °C in hydrogen yielded tungsten or molybdenum metal and UO_2. These results are essentially in agreement with data reported on the U–W–O system by Trunov, Kovba & Spitsyn (1961). Although they show schematic line diagrams of X-ray patterns for the isostructural UO_2WO_4, UO_2MoO_4 and UO_2CrO_4 compounds, no crystallographic data were given.

Powder diffractometry and Weissenberg single-crystal photographs established the crystal symmetry as monoclinic with the following lattice constants:

	UO_2WO_4	UO_2MoO_4
a	7·205 ± 0·003 Å	7·200 ± 0·003 Å
b	5·482 ± 0·002 Å	5·480 ± 0·002 Å
c	13·57 ± 0·01 Å	13·59 ± 0·01 Å
β	104° 35′	104° 36′
Volume	518·59 Å^3	518·96 Å^3

Table 1. *X-ray powder diffraction patterns*

UO_2WO_4			UO_2MoO_4	
d	Relative intensity	hkl	d	Relative intensity
6·92	12	100	6·93	22
—	—	002	6·55	3
5·50	4	$\bar{1}02$	5·51	14
5·03	12	011	5·03	1
4·30	15	110, $\bar{1}11$	4·30	19
4·19	100	012	4·20	100
3·909	48	111	3·915	24
3·483	25	200	3·480	20
3·453	16	$\bar{2}02$	3·457	18
—	—	013	3·423	4
3·363	12	112	3·367	11
3·333	18	$\bar{1}13$	3·341	12
3·278	23	004	3·286	31
3·007	2	$\bar{2}11$	—	—
2·940	14	210	2·933	11
2·923	10	$\bar{2}12$		
2·856	3	113	—	—
2·827	3	$\bar{1}14$	2·833	5
2·816	3	014	2·820	4
2·802	8	202	2·801	5
2·757	8	$\bar{2}04$	2·762	7
—	—	020	2·739	2
2·720	4	104	2·721	5
2·678	2	021	2·683	4
2·546	28	$\bar{1}21$, 120	2·548	10
2·495	2	212	—	—
2·465	4	$\bar{2}14$	2·465	3
2·452	9	$\bar{1}22$	2·455	6
2·368	1	015	—	—
2·322	4	300	2·321	5
2·304	7	122	2·305	7

The space group was unambiguously determined from systematic absences to be $P2_1/c$ with 4 formula units in the unit cell. Calculated theoretical densities are 6·63 and 5·50 g.cm^{-3} for UO_2WO_4 and UO_2MoO_4 respectively. The measured value for the tungsten compound was 6·46 g.cm^{-3} by the displacement method.

Powder diffraction patterns of these compounds are shown in Table 1.

Table 1 (*cont.*)

UO_2WO_4			UO_2MoO_4	
d	Relative intensity	hkl	d	Relative intensity
2·257	1	$\bar{1}06$	2·260	4
2·189	3	$\bar{3}12$	2·188	4
—	—	$\bar{3}04$	2·172	1
2·125	11	$\bar{3}13$	2·122	10
2·120	18	123		
2·103	5	024, 115	2·105	4
2·085	4	$\bar{1}16$	2·089	3
2·039	7	311	2·036	8
2·034	7	302, 016		
1·992	3	214	1·992	4
1·966	4	$\bar{2}16$	1·969	4
1·960	3	222	1·958	2
1·919	7	$\bar{1}25$	1·922	4
1·908	4	312	1·909	4
1·895	3	025	1·899	4
1·840	5	$\bar{3}06$, 116	1·841	6
1·825	6	223	1·823	4
1·808	5	031	1·809	4
1·803	12	$\bar{4}02$	1·800	6
1·783	2	215	—	—
1·774	3	017	1·777	1
		320	1·771	5
1·767	6	130, 313, $\bar{1}31$	1·767	5
1·760	5	$\bar{2}17$	—	—
1·742	2	$\bar{1}26$	1·743	4
1·737	7	131	1·736	5
1·715	2	321	1·712	1
1·711	2	026		
1·697	2	$\bar{1}08$	1·698	1
1·685	6	033	1·686	6

Formulae of these compounds have been written as uranyl orthotungstate or molybdate to conform to the original Russian nomenclature although no structural evidence is as yet available to confirm the existence of these groups of ions. The actual coordination of the metal atoms must be determined by rigorous structure analysis.

References

TRUNOV, V. K., KOVBA, L. M. & SPITSYN, V. I. (1961). Doklady Akad. Nauk SSSR, No. 1, 114.

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