The only systematically absent X-ray reflexions are $(0k0)$ with k odd. The space group is therefore $P2_1$ or $P2_1/m$. Since the density is 1·164 g.cm.$^{-3}$ (Jaeger, 1914), there are four molecules in the unit cell ($\varrho_{calc.} = 1{\cdot}19 \pm 0{\cdot}02$ g.cm.$^{-3}$).

I do not intend to proceed with analysis of the structure of this compound. I thank Prof. W. Wardlaw for the gift of a specimen of bisacetylacetoneberyllium.

Reference

JAEGER, F. M. (1914). *Rec. Trav. chim. Pays-Bas*, **33**, 388.

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The crystal structures of PuAs, PuTe, PuP and PuOSe.*

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Compounds of the MX type containing plutonium and the metalloid elements arsenic, tellurium, and phosphorus have been prepared, and their common crystal structure has been identified. These compounds are of the NaCl type, isostructural with the analogous uranium compounds (Ferro, 1954; Iandelli, 1952; Zumbusch, 1941).

Preparation of the compounds was carried out by induction heating of small samples (5–10 g.) under vacuum or in a helium atmosphere of slightly less than atmospheric pressure. Attempts to prepare compounds containing some atomic percentage of plutonium other than 50 were not successful. The combination of the constituents on heating resulted in every case in a strongly exothermic reaction. It is concluded, therefore, that the MX compounds are quite stable. They appear to undergo decomposition, rather than melting, in the neighborhood of 2000° C. If other compounds of plutonium with the same metalloid elements exist, it seems likely that they are less stable than the MX compounds and would, therefore, have been decomposed at the temperature of the strongly exothermic reactions that in every case resulted in the formation of an MX compound only.

The unit-cell dimensions (Cu rays, resolved doublets, $\alpha_1 = 1{\cdot}54051$, $\alpha_2 = 1{\cdot}54433$ Å) and calculated densities for the MX compounds are

	a_0 (Å)	ϱ (g.cm.$^{-3}$)
PuAs	$5{\cdot}855 \pm 0{\cdot}004$	10·39
PuTe	$6{\cdot}183 \pm 0{\cdot}004$	10·33
PuP	$5{\cdot}644 \pm 0{\cdot}004$	9·87

It was not found possible by the method employed to prepare an MX compound with selenium; the Debye pattern of a plutonium–selenium product indicated, however, the presence of a new phase that was not immediately identified. This product was subsequently found by W. H. Zachariasen (unpublished) to be PuOSe, which has the tetragonal PbFCl structure with unit cell dimensions

$$a_1 = 4{\cdot}151 \pm 0{\cdot}003, \quad a_3 = 8{\cdot}369 \pm 0{\cdot}005 \text{ Å}$$
$$(\text{Cu } K\alpha = 1{\cdot}5418 \text{ Å}).$$

The calculated density is 7·69 g.cm.$^{-3}$.

The diffraction data for PuOSe appear in Table 1. No further work on this compound is contemplated.

Table 1. *Diffraction data for* PuOSe

hkl	$(\sin^2\theta)_o$	$(\sin^2\theta)_c$	I_o
002	0·0347	0·0339	*w*−
101	0·0439	0·0430	*m*+
102	0·0702	0·0684	*w*
110		0·0690	
003	0·0785	0·0762	*w*
111		0·0775	
112	0·1044	0·1029	*s*
103	0·1122	0·1107	*m*
004	0·1397	0·1355	*wm*
200		0·1380	
113	0·1471	0·1452	*vw*
201		0·1465	
104	0·1730	0·1700	*w*
202			
211	0·1827	0·1810	*m*−
203	0·2162	0·2142	*w*
105	0·2509	0·2462	*ms*
213		0·2487	
204	0·2782	0·2735	*w*
220		0·2760	
115	0·2829	0·2807	*vw*
214	0·3104	0·3080	*w*−
301	0·3198	0·3190	*vw*
106	0·3411	0·3394	*w*
302	0·3478	0·3444	*vw*
310		0·3450	
205	0·3544	0·3497	*w*
223		0·3522	
311		0·3535	
116	0·3759	0·3739	*vvw*
312	0·3810	0·3789	*w*
215	0·3869	0·3842	*w*
303		0·3867	
224	0·4139	0·4115	*vw*
313	0·4238	0·4212	*vw*
321	0·4589	0·4570	*w*−
216	0·4790	0·4774	*m*
323	0·5257	0·5247	*m*
207	0·5557	0·5529	*w*
108	0·5778	0·5766	*w*−
308	0·8537	0·8526	—
431, 501	0·8709	0·8710	—
1,0,10	0·8815	0·8815	—
416	0·8929	0·8914	—
336	0·9261	0·9259	—
433, 503	0·9373	0·9387	—

References

FERRO, R. (1954). *Z. anorg. Chem.* **275**, 320.
IANDELLI, A. (1952). *R. C. Accad. Lincei*, **13**, 138.
ZUMBUSCH, M. (1941). *Z. anorg. Chem.* **245**, 402.

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