

Taking the average values of f from the equation $h = \frac{5f}{2f+1}$ for different months as 0.180, the rigidity value of the Earth $\mu = gd\rho/19f$ (where g is 978.5 dynes/sec², d , density 5.52 g/c.c. and ρ = distance from the centre of the Earth to the observation point = 6375.567 km) is found to be 1.1×10^{12} dynes/cm², which value is in general agreement with those obtained by other workers.

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CRYSTALLOGRAPHY

New Representatives of the NbAs₂ and ZrAs₂ Structures

THE monoclinic unit cell and the space group of NbAs₂ and isomorphous TaAs₂ have recently been determined by Saini *et al.*¹ In the course of an examination of transition-element polycrystals I observed this structure also in VP₂, VAs₂, NbP₂, TaP₂, MoAs₂, α -WP₂ (low-temperature modification) and WAs₂. The titanium-group phosphides TiP₂, ZrP₂ and HfP₂, on the other hand, were found to be isostructural with the orthorhombic ZrAs₂ (ref. 2) and HfAs₂ (ref. 3). This structure is referred to as PbCl₂ (C23) type. However, in these titanium-group pnictides anion-anion bonds seem to be important so that I prefer to distinguish this variety from the ionic PbCl₂ type by using a different name. The lattice constants, as derived from powder patterns, are listed in Table 1.

Table 1. LATTICE CONSTANTS OF ORTHORHOMBIC ZrAs₂-TYPE AND MONOCLINIC NbAs₂-TYPE PHASES

	a (Å)	b (Å)	c (Å)	β
TiP ₂	6.181 ± 3	8.256 ± 3	3.346 ± 3	
ZrP ₂	6.494 ± 3	8.744 ± 3	3.513 ± 3	
HfP ₂	6.467 ± 3	8.646 ± 3	3.497 ± 3	
VP ₂	8.466 ± 0	3.106 ± 2	7.170 ± 8	119° 16' ± 4'
VAs ₂	9.059 ± 7	3.272 ± 2	7.481 ± 7	119° 47' ± 4'
NbP ₂	8.878 ± 9	3.266 ± 2	7.529 ± 9	119° 8' ± 5'
TaP ₂	8.870 ± 8	3.267 ± 2	7.497 ± 7	119° 24' ± 4'
MoAs ₂	9.064 ± 6	3.295 ± 2	7.715 ± 8	119° 22' ± 3'
α -WP ₂	8.501 ± 9	3.167 ± 2	7.471 ± 8	119° 20' ± 4'
WAs ₂	9.079 ± 5	3.318 ± 2	7.692 ± 5	119° 26' ± 3'

My samples all showed metallic conductivity and a positive thermoelectric power of 10–25 μ V/°C. I do not know at present whether the metallic conductivity is an intrinsic property of all these compounds or if it is due only to impurities or to a deviation from stoichiometry. In the ZrAs₂-type compounds the tendency to saturate all bonds is obvious. All anions form pairs which would suggest an ionic formula Zr⁴⁺(As₂)⁴⁻. The probability for the occurrence of semiconducting properties should be greatest in the 5d compound HfP₂. If a parallelism between corresponding $d\varepsilon^6$ and d^0 compounds



is postulated we would expect a rather large energy gap in the case of HfP₂. The As-As distance 2.58 Å (ref. 3) reported for HfAs₂, on the other hand, is somewhat large for a saturated anion-anion bond (As-As single-bond distance 2.42 Å (ref. 4)), indicating the possibility that a small fraction of the cation electrons are left in a metallic d band.

Though the detailed structure of NbAs₂ is not known*, we suppose that the anions also form pairs in this type of structure. In the vanadium-group phases one then expects to find a similar metallic d band as in the corresponding dichalcogenides VSe₂, NbS₂, TaS₂, etc. It is interesting that MoAs₂, α -WP₂ and WAs₂ also crystallize

in the NbAs₂ structure. In these latter compounds two extra d electrons of the cation would be sufficient to fill a d^2 band supposing the cation to have a trigonal prismatic environment. In this case, then, diamagnetism and non-metallic properties would be possible as in MoS₂, WS₂, etc. In the high-temperature modification β -WP₂, which crystallizes in the MoP₂ structure⁵, anion pairs are still present (P-P = 2.17 Å, corresponding to a single bond). The cation has in fact six P neighbours forming a trigonal prism but a seventh W-P bond occurs and this additional bond may explain the observed metallic behaviour of MoP₂ and β -WP₂.

I thank Miss Elfriede Rittershaus and Mr. H. U. Boelsterli for assistance in sample preparation and X-ray work.

* Note added in proof. Meanwhile, the structure of NbAs₂ and of isomorphous NbSb₂ has been determined⁶. Since only half of the As atoms form pairs (As_{II} - As_{II} = 2.45 Å, whereas As_I - As_I = 2.98 Å) the structure would allow NbAs₂ to be a diamagnetic semiconductor with ionic formula Nb⁵⁺(As₂)⁴⁻As₂²⁻. The observed metallic properties, therefore, are due to an accidental overlapping of bands as occurs in TiTe₂ and PdSb₂. TaSb₂ is isomorphous with NbSb₂ and has the following lattice constants: $a = 10.22 \pm 2$ Å; $b = 3.644 \pm 4$ Å; $c = 8.29 \pm 2$ Å; $\beta = 120^\circ 24' \pm 8'$.

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CHEMISTRY

Water Structure around Silver Iodide Sol Particles

IN order to explain lower values of differential capacity at the negative silver iodide/solution interface than at the mercury/solution interface, Lyklema¹ proposed that the Stern layer in the former may be of icelike (tetrahedral) structure, and pointed out that this would also explain the greater specificity of cations in the silver iodide case. More recently Levine and Bell² have commented that such structure would tend to remove the distinction between inner and outer Helmholtz planes so that the fluctuation potential would become small, this making the maximum in the outer Helmholtz plane potential much less marked. This effect would then explain the relative constancy of the flocculation concentration for silver iodide sols at high (negative) potentials^{3,4} compared with those of silver bromide and silver chloride sols, which have been reported⁵ to decrease at high negative potentials. The hypothesis is supported by the well-known epitaxis of ice on silver iodide which is more effective near the zero point of charge⁶.

The purpose of this note is to report further evidence of such structure both from pulsed proton nuclear magnetic resonance (spin-echo⁷) measurements on negative silver iodide sols and from studies on the rates of rapid flocculation of these sols at varying surface potential by excess electrolyte.

For the spin-echo measurements (using a spectrometer constructed by Mr. W. E. Porter of this department) silver iodide sols were prepared by the addition of 0.1 M silver nitrate solution to 0.11 M potassium iodide solution followed by dialysis in 'Cellophane' tubing against constantly renewed distilled water at 25° C for about 10 days. This procedure reduces the excess iodide concentration to about 10⁻⁵ M (pI 5) or below. For measurements at