

Citation:

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formed by the involutions (R_1, R_2, R_3) belonging to the conics of the pencil (β^2) .

The curves σ^5 belonging to two base-points B_1, B_2 (§ 6) have in those points 12 intersections and 8 in B_3, B_4 ; they further pass through the cyclic points on l_∞ and through the point at infinity of B_2B_4 . The two points S , which they have moreover in common are each the end of two chords of osculation B_1S, B_2S . Any two base-points belong therefore to two groups of T_3 .

Let us now consider the locus of the points R_2, R_3 belonging to $R_1 \equiv B_1$. This singular curve, β_1 , has nodes in B_2, B_3, B_4 , but does not pass through B_1 , T_3 possessing no coincidences outside l_∞ . As an arbitrary conic of (β^2) contains one pair R_2, R_3 , consequently has eight points in common with β_1 , each base-point determines a rational singular curve of order four.

The parabola too are singular curves and as such associated to their points at infinity.

Any straight line $B_k B_l$ corresponds to itself in the transformation (R_1, R_2) ; for each of its points may be considered as point of contact of a γ_3 , intersecting $B_m B_n$ on l_∞ .

If R_1 describes a β^2 , β^2 is described twice by $R_2 (R_3)$. So β^2 is transformed by (R_1, R_2) into the figure composed of the four singular curves β_k^4 and the conic β^2 counted twice, consequently into a figure of order 20. From this it ensues that the transformation in question transforms a straight line into a curve of order ten.

This c^{10} has in each base-point a quadruple point.

Chemistry. — “Compounds of the arsenious oxide”. I. By Prof. F. A. H. SCHREINEMAKERS and Miss W. C. DE BAAT.

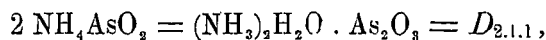
The system: $H_2O-As_2O_3-NH_3$ at 30° .

Of the different ammonium arsenites which may be imagined to be deduced of the H_3AsO_3 , $H_4As_2O_5$ and $HAsO_2$, $(NH_4)_3As_2O_5$ and NH_4AsO_2 are described as crystals and $(NH_4)_3AsO_3$ as a thick-fluid yellow mass.

Now we have examined the system $H_2O-As_2O_3-NH_3$ at 30° ; from this it is apparent that the salt NH_4AsO_2 occurs at 30° , while the possibility that also still a salt of the composition $NH_4H_2AsO_3$ exists, is not excluded.

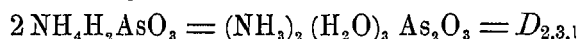
In fig. 1 we find a schematical representation of the equilibria occurring in this system at 30° ; with the aid of table I we can accurately draw the different curves.

The point $D_{2.1.1}$ represents the NH_4AsO_2 ; in order to find the position of this point in the triangle, we must consider that:



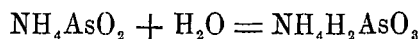
the salt NH_4AsO_2 contains consequently 13.6% NH_3 , 7.2% H_2O and 79.2% As_2O_3 so that the position of the point $D_{2.1.1}$ is known.

The point $D_{2.3.1}$ represents the $\text{NH}_4\text{H}_2\text{AsO}_3$; as



this salt contains 11.9% NH_3 , 18.9% H_2O and 69.2% As_2O_3 .

When we draw in the figure the points $D_{2.1.1}$ and $D_{2.3.1}$, then it is apparent that they are situated on a straight line with the angle-point W . That this must really be the case, follows also from the equation



from which it is apparent that the $\text{NH}_4\text{H}_2\text{AsO}_3$ may be considered as consisting of NH_4AsO_2 and H_2O .

Curve ab represents the solutions saturated with solid As_2O_3 ; these complexes have been shaken during about a month at 30° . The As_2O_3 which we have used was an extremely fine flour-like powder; in each of the small bottles we brought a little sublimated As_2O_3 and a little As_2O_3 which was recrystallized from a strong, heat solution of chloric acid.

Point a represents the solubility of As_2O_3 in pure water; as it is apparent from table I we find for this 2.26%; BRUNER and TOLLOZKO found that at 25° and 39.8° in 100 Gr. water 2.03 and 2.93 Gr. As_2O_3 are dissolved. It appears from the analysis of the rests that the solid phase is not a hydrate, but that it is the anhydric As_2O_3 .

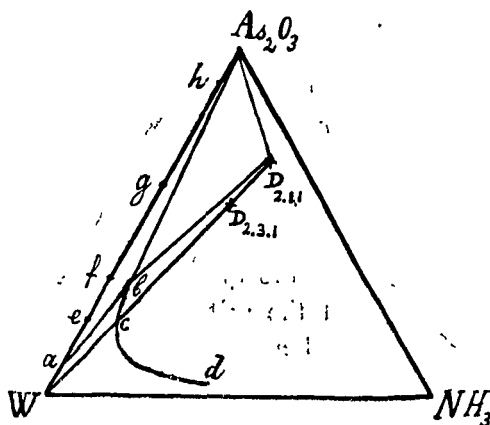


Fig. 1.

Curve bcd represents the solutions with $D_{2.1.1} = \text{NH}_4\text{AsO}_2$. As the

line $W.D_{2.1.1}$ intersects this curve bcd in the point c , the salt NH_4AsO_2 is soluble in water at 30° without decomposition. The saturated aqueous solution of this salt is represented by point c ; it is apparent from the position of the points W , c and $D_{2.1.1}$ with respect to one another that this solution contains $\pm 19.2\%$ NH_4AsO_2 .

We have deduced with the aid of the rest-method the composition of the solid phase, which is in equilibrium with the solutions of branch bcd . The conjugationlines liquid-rest are going viz. all through the point $D_{2.1.1}$. As the point $D_{2.3.1}$, however, is situated close to $D_{2.1.1}$, the conjugationlines for the solutions of branch bc go within the errors of analysis, also through the point $D_{2.3.1}$. Although it is, therefore, sure that the solutions of cd which are situated at some distance of c , are saturated with $D_{2.1.1} = NH_4AsO_2$, yet the possibility exists that the other solutions are saturated with $D_{2.3.1} = NH_4H_2AsO_3$.

It is apparent from the table that branch bcd is determined no further than to a solution d , which contains 14.28% NH_3 . In order to examine if with higher content of NH_3 in the solution perhaps still a compound should occur with more NH_3 than in the compound NH_4AsO_2 , we have still examined a solution at 0° , which contained 36.05% NH_3 . It was apparent that also in this case the solid phase was still the NH_4AsO_2 .

From the course of curve ab and from table 1 it is apparent that the solubility of the As_2O_3 increases strongly with increasing content of ammonia of the solution. The terminating point b , viz. the solution which is saturated with $As_2O_3 + NH_4AsO_2$, is not determined. The solution of branch ab which is experimentally determined and which is situated the nearest to the point b contains (compare table) 21.17% As_2O_3 and 2.86% NH_3 . It is apparent from the course of the branches ab and bcd that the solution b will contain $\pm 22\%$ As_2O_3 and $\pm 2.87\%$ NH_3 . From this it appears, therefore, that small quantities of NH_3 strongly increase the solubility of the As_2O_3 .

We imagine in fig. 1 the line NH_3-b to be drawn; its point of intersection with the side $W-As_2O_3$ is represented in the figure by f ; this point f indicates a complex which contains $\pm 22.5\%$ As_2O_3 and consequently $\pm 77.5\%$ water. Now we take a complex e , situated between a and f ; this contains, therefore, more than 2.26% and less than 22.5% As_2O_3 , and consequently it consists of solution a + solid As_2O_3 . When we bring NH_3 -gas into this complex, then it follows the line $e-NH_3$; this line intersects, starting from e , firstly the region ab As_2O_3 , afterwards the region $Wabcd$ and further the region $bcdD_{2.1.1}$. Hence it follows that by adding

gaseous NH_3 , first the As_2O_3 is dissolved and an unsaturated solution occurs and that on further addition of NH_3 , the solid NH_4AsO_2 is separated; the solution follows the curve bcd in this case, starting from b and gets, therefore, gradually poorer in As_2O_3 , which is deposited as NH_4AsO_2 . We imagine also in fig. 1 the line $\text{NH}_3 - D_{211}$ to be drawn; its point of intersection with $W - \text{As}_2\text{O}_3$ is represented by h . The point h indicates a complex which contains $\pm 91.5\%$ As_2O_3 and consequently $\pm 8.5\%$ water. Now we take a complex g between h and f ; this contains, therefore, more than 22.5% and less than 91.5% As_2O_3 and it consists of solution $\alpha +$ solid As_2O_3 . When we bring NH_3 -gas into this complex, it follows the line $g - \text{NH}_3$; this line intersects, starting from g , first the region $ab \text{As}_2\text{O}_3$, after that the threephasetriangle $b - D_{211} - \text{As}_2\text{O}_3$ and afterwards the region $bcd \text{As}_2\text{O}_3$. Hence it follows that on addition of gaseous NH_3 , first As_2O_3 is dissolved until solution b

TABLE I.

Compositions in percentages by weight at 30° .

of the solution		of the rest		solid phase
$\% \text{NH}_3$	$\% \text{As}_2\text{O}_3$	$\% \text{NH}_3$	$\% \text{As}_2\text{O}_3$	
0	2.26	—	—	As_2O_3
1.41	10.98	0.37	59.79	"
2.78	20.49	1.24	63.10	"
2.86	21.17	1.21	64.26	"
2.88	18.43	7.43	43.13	NH_4AsO_2
3.13	12.30	7.25	38.59	"
3.18	11.13	7.51	38.39	"
3.91	7.63	8.24	35.80	"
5.82	5.61	9.08	36.44	"
6.95	4.72	9.74	35.55	"
9.25	3.44	11.42	41.79	"
9.93	3.20	11.74	42.44	"
10.06	3.14	12.22	49.14	"
13.98	2.50	13.78	42.50	"
14.28	2.16	13.77	44.78	"

is formed; the liquid contains then 22 % As_2O_3 and 2.87 % NH_3 . On further addition of NH_3 the solution keeps the composition b as long as the complex remains within the threephasetriangle $b \cdot D_{211} \cdot \text{As}_2\text{O}_3$, and we have the complex: $\text{As}_2\text{O}_3 + \text{NH}_4\text{AsO}_2 + \text{solution } b$. The only thing that happens on addition of NH_3 is the conversion of As_2O_3 into NH_4AsO_2 . When all the As_2O_3 has disappeared and has been converted into NH_4AsO_2 , then on further addition of NH_3 the solution follows curve bcd , in which case its content of As_2O_3 decreases continuously.

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Chemistry. — "*The allotropy of potassium.*" I. By Prof. ERNST COHEN and Dr. S. WOLFF.

1. We have in view to investigate here whether potassium as it has been known hitherto is a metastable system in consequence of the simultaneous presence of two or more allotropic forms of this metal.

It will become evident from the following lines that the literature already contains very accurate data for solving this problem.

2. As long as thirty years ago ERNST HAGEN¹⁾ published his very careful experiments on the determination of the coefficient of expansion of potassium, which were carried out with the dilatometer.

Contrarily to many other physicists he bestowed much care on the purity of the material used. The specimen of potassium experimented with contained only a *trace* of sodium (in 6 or 7 grams).

3. For a description of the details of the measurements the reader is referred to the original paper, but it may be pointed out here that the agreement between the determinations made with two different dilatometers (containing ± 10 grams of potassium each) was exceedingly satisfactory.

The measurements are summarized in the Tables I and II, where t indicates the temperatures at which the experiments were made, while v indicates the volume (in ccm.) of 1 gram of the metal.

¹⁾ Wied. Ann. 19, 436 (1883).