

XLVI.—*Rubidamide*.

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THE behaviour of metallic rubidium towards ammonia is similar to that of the other alkali metals described in a previous paper (Trans., 1894, 66, 504—519). It was there pointed out that lithium displaces hydrogen in ammonia with considerable energy, potassium less violently, whilst sodium, although it reacts readily, is not nearly so active as potassium. Lithium, even in the cold, quickly absorbs the gas and forms a bright orange liquid coating, or lacquer, on its surface, which appears to be a solution of lithium in ammonia analogous to sodammonium, and which at once changes to lithamide on heating.

Metallic rubidium has a more marked action on ammonia than either potassium or sodium, although not so energetic as lithium, which usually glows when heated in the gas. The experiments with rubidium were carried out in a silver boat, contained in a silver-lined glass tube, as previously described; for rubidamide, like its analogues, has a corrosive action on glass and porcelain. When small pellets of the metal are exposed to a slow stream of pure gaseous ammonia, the formation of rubidamide commences in the cold, the bright surface of the metal becoming coated with a white crust, which more or less protects it from the further action of the gas. On heating to between 200—300°, this fuses to oily drops which quickly flow off, and being specifically heavier, leave the metallic surface of the floating melted rubidium exposed to the action of the ammonia. While in contact with the metal the liquid is dark blue, and contains rubidium in solution, probably as a di-rubidammonium,  $\text{Rb}_2\text{H}_2\text{N}\cdot\text{NH}_2\text{Rb}_2$ , that is, a solution of the metal in melted rubidamide, analogous to Joannis' solution of sodium in liquid ammonia.

This beautiful dark-blue solution is in every way similar to that obtained in the case of sodium and potassium, and on heating in ammonia becomes quickly decolorised, forming rubidamide.

In the preparation of the amide as above, the action proceeds with great readiness, hydrogen being continually evolved, and if only

0.25 gram of the metal is taken, the conversion is complete in less than 5 minutes. The action is, therefore, more rapid than in the case of potassium, but the metal does not glow, as in the case of lithium.

On allowing the melted amide to cool, it solidifies to a white, crystalline, glistening mass of small plates, very similar to potassamide. Lithamide crystallises in needles.

*Composition.*—This was only determined by the somewhat rough method of synthesis, owing to the difficulty of making an analysis with comparatively small quantities of such an excessively hygroscopic substance. The method adopted was similar to that used in the case of the other amides, in which a short silver or platinum-lined tube, provided with two stopcocks, and containing a silver boat, was used. The method is not accurate owing to the slight loss by volatilisation during the synthesis of the amide. This renders the percentage of rubidium higher than it should be, but the result is sufficient to show that the composition of rubidamide corresponds to the formula,  $\text{RbNH}_2$ .

Weight of rubidium taken.	Weight of rubidamide formed.	Percentage of rubidium.
0.2383	0.2760	86.36
Theory for $\text{RbNH}_2$ .....		84.19

Among the properties of rubidamide, its melting point is of interest. This was determined in a similar way to that of sodamide, &c., and was found to be  $285^\circ$ — $287^\circ$ , which is close to that of potassamide. The melting points of the four amides of the alkali metals are as follows:

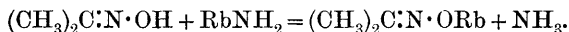
	Melting point.
Sodamide, $\text{NaNH}_2$ .....	$155^\circ$
Potassamide, $\text{KNH}_2$ .....	$270$ — $272^\circ$
Rubidamide, $\text{RbNH}_2$ .....	$285$ — $287^\circ$
Lithamide, $\text{LiNH}_2$ .....	between $380^\circ$ & $400^\circ$

In the fused state, rubidamide, like the others, forms a greenish-brown, oily liquid, which has a tendency to creep, and which assumes a darker colour on heating more strongly, probably owing to slight dissociation. At about  $400^\circ$ , it begins to distil as a brownish-liquid, and, if the vapour is more quickly cooled, part of it is deposited as a white sublimate or powder. In one experiment, conducted in a platinum-lined glass tube containing a silver boat, the rubidamide was heated for some time in a gentle stream of ammonia; most of it distilled away, and on cooling the residue had a glassy appearance, but consisted entirely of unchanged rubidamide. There was no evidence whatever of the formation of any nitride such as Davy and Gay Lussac were alleged to have obtained in the case of potassamide.

On heating rubidamide in contact with glass, it at once attacks the latter, effervescing from evolution of ammonia, and being converted into rubidium silicate. The action, however, is not nearly so marked as that of sodamide or even potassamide.

Rubidamide is an excessively deliquescent substance, and is violently decomposed by water, giving ammonia and rubidium hydroxide ; it is less violently acted on by alcohol, but effervesces, evolving ammonia and forming rubidium ethoxide.

The action of rubidamide on organic compounds, as would be expected, is similar to that of its analogues. Complex organic matter is at once charred, whilst organic compounds of an amidic or faintly acid nature, &c., evolve ammonia, and suffer replacement of a hydrogen atom by rubidium. Thus, for instance, when the ground amide is warmed gently with a benzene solution of acetoxime, ammonia is quickly liberated and a white precipitate of rubidium acetoxime is produced ; when collected and dried, it is a fine, white powder. The action is similar to that of sodamide (see p. 461), thus :



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