Chemistry. — *"The Electromotive Behaviour of Aluminium"*. II.[1]). By Prof. A. Smits and G. J. de Gruijter. (Communicated by Prof. P. Zeeman).

(Communicated at the meeting of Nov. 27, 1920).

With a view to obtaining a better insight into the electromotive behaviour of aluminium and its alloys with mercury, the melting-point diagram was first determined. It was found that, as follows from the subjoined T,X-figure 1, no compound occurs in the system
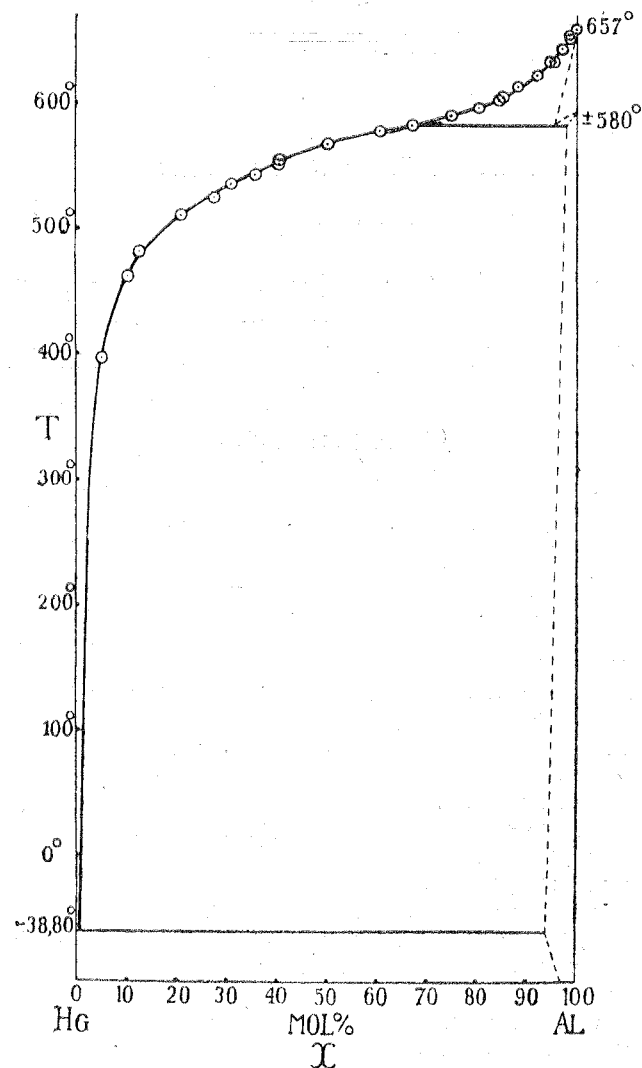

Fig. 1.

[1]) First communication, These Proc. XXII, N⁰. 9 and 10, p. 876.

Hg-Al, and that the melting-point line of aluminium consists of two branches, in consequence of the occurrence of a transition point lying at about 585°.

The determination of the melting-point diagram served by way of orientation, and now that no compound appeared to exist, it was certain that the EX-figure corresponding to the ordinary temperature, must belong to the type I or II in Fig. 2.

Type 1.   Fig. 2.   Type 2.
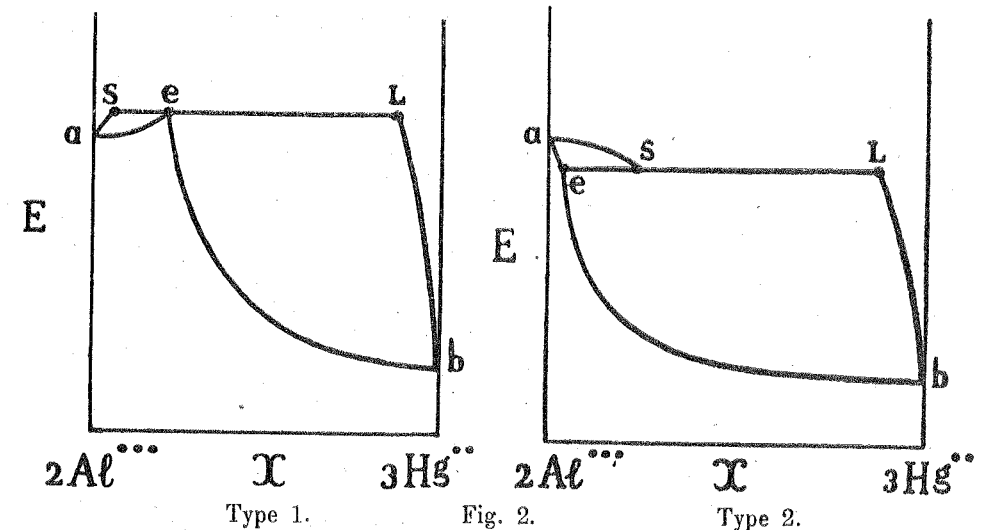
Assuming, as has been done before, that Gibbs's paradox is also applicable to the components of a mixed crystal phase present in diluted state, the formula[1]):

$$E = -\frac{0.058}{\nu F} \log \frac{L_M}{(M_L^{\nu})} - 2,8.$$

was found for the exp. electric potential.

This formula already shows that when we first determine the potential of Aluminium immersed in a non-aqueous solution of an Al-salt, and then in an equivalent solution of an Al-salt + a Hg-salt, the direction of the potential change will depend on which quantity has decreased more, L_M or (M_L^{ν}) [2]).

If $(Al_L^{\cdot\cdot\cdot})$ has decreased more, the potential will be more negative, if on the other hand (L_{Al}) has decreased more, the potential will have become less negative.

It is evident that it is also possible to follow the opposite course;

[1]) These Proc. XXI, N⁰. 4, p. 562.

[2]) L_m is now not a constant quantity, but decreases with greater mercury content.

electrodes with different quantities of mercury may be made beforehand, and then they may be immersed in a non-aqueous solution of an aluminium salt, to determine the electric potential.

Without entering here further into the method of experimenting, we will state already now that the coexisting electrolyte is always relatively richer in aluminium than the mixed crystal, so that it could be deduced with certainty from this that the E,X-figure of the system Al-Hg belongs to the second type.

But what is remarkable is that though in virtue of the concentration of the coexisting phases it would be expected that the potential of the Aluminium in an Al-salt solution becomes less negative on addition of a little of a mercury salt, just the reverse takes place, and even to a very considerable degree.

This exceedingly remarkable phenomenon shows that, as was already pre-supposed before, the mercury dissolved in aluminium is a catalyst for the internal conversions in the aluminium. The metal magnesium, which is being examined by Mr. BECK, behaves in an analogous way, but the effects are less.

In a following communication we shall enter more deeply into the interesting phenomenon mentioned here.

Laboratory for General and Inorganic
Chemistry of the University.

Amsterdam, June 1920.

Chemistry. — *"The Existence of Hydrates in Aqueous Solutions"*. By Prof. A. SMITS, L. v. D. LANDE, and P. BOUMAN. (Communicated by Prof. P. ZEEMAN).

(Communicated at the meeting of December 18, 1920).

Since the research "On Retrogressive Melting-Point Lines"[1], in which an indirect proof was given for the presence of hydrated Na_2SO_4 molecules in the aqueous solution, attemps have now and then be made to find other methods, which might be able to give an answer to the question whether formation of hydrates takes place in the aqueous solution, also in cases of melting-point lines with normal courses.
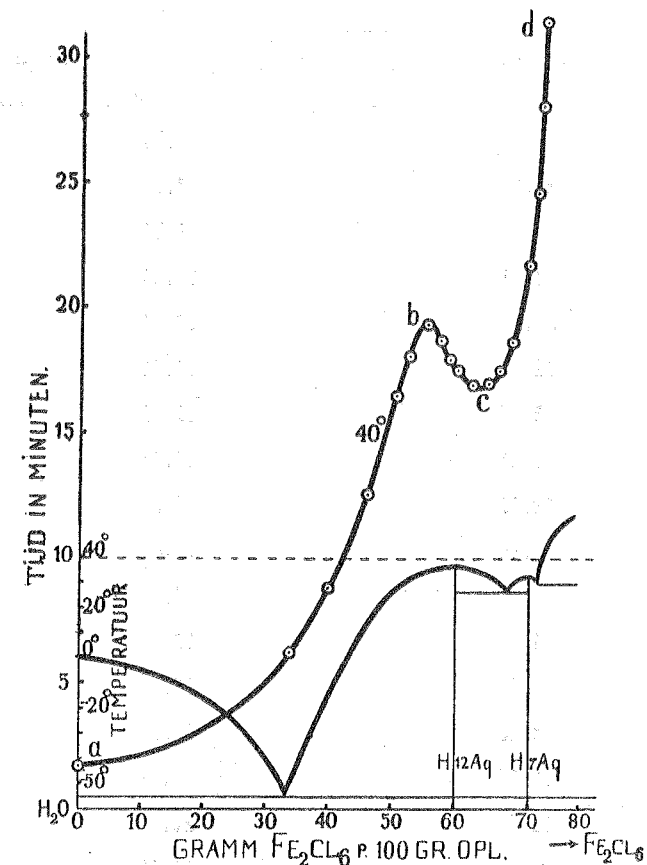

Fig. 1.

[1] SMITS, These Proc. Vol. 14 p. 170 (1911).