

the following compounds is formed: 1) $A_1R \cdot A_2R$, 2) $A_1R \cdot (A_2R)_3$ and 3) $(A_1R)_3 \cdot A_2R$. From Fig. 3 is seen that the symmetric compound gives a decreasing $\log \lambda_{21}(X_2)$ curve, the asymmetric compounds AB_3 and A_3B give curves with maximum or minimum. For arbitrary values of z_1 and z_2 the $\log \lambda_{21}(X_2)$ curves have essentially the same form as those reproduced in Fig. 3.

By comparing Figs. 1–3 with the corresponding Figs. in the preliminary communications by Högfeldt *et. al.*^{3–4} or in the full paper by Högfeldt⁵ it is seen that they have the same general form. Especially the g curves calculated from Marinsky's measurements have a form almost identical with those caused by compound formation. The point of intersection gives $X_2 = 0.17$. From (6) and (7) $X_2 = 0.17$ gives $v = 1$, $u = 5$. The compound $(HR)_5 \cdot BaR_2$ has also been proposed by Marinsky and Coryell⁶, who found by trial that it fitted the experimental data. The first to use this approach was probably Kielland⁷, who attributed the deviations from Duhem-Margules equation he found in ion exchange systems to compound formation.

Although certainly over-simplified, the assumption of compound formation is, so far as I know, the only approach hitherto published that gives an explanation of the existence of extreme values of the equilibrium quotients. Any theory dealing with ion exchange equilibria must allow for such extremes, and the striking qualitative agreement of this simple assumption with experimental data may perhaps focus the attention on some kind of interaction between the components in the exchanger.

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Dissolving velocity of Metals in Deutero-Electrolytes

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The present paper is a preliminary report on experiments dealing with the dissolution of metals in acids and bases, the hydrogen content of which had been partly or completely replaced by deuterium.

Dissolving velocity experiments. The dissolving velocity of metals in non-oxidizing acids is usually determined by measuring the rate of hydrogen evolution. This method was also employed in the present study. Some results are given here for zinc, aluminium and iron.

1. *Zinc.* 2 mm wire, prepared from a very pure zinc was used. The reagents were 1 *N* hydrochloric acid and 2 *N* sulphuric acid with varying content of deuterium. Curves representing the mean values from the experiments with sulphuric acid at 25° C are shown in the diagram Fig. 1. Similar curves were obtained in the experiments with hydrochlorid acid.

Further it was attempted to establish a sort of "model local element", the cathodic area of which could be maintained constant during the dissolving process. The anode of the element, 2 mm zinc wire, was fixed axially in a nickel cylinder, and the ends of the wire connected to the cylinder.

When this element was immersed in acid practically all the hydrogen liberation took place at the inside area of the nickel cylinder.

The curves obtained were of a different character than those shown in Fig. 1. There

was no period of induction. The average dissolving velocities at different D-concentrations are given in Table 1.

Table 1. Dissolving velocity ρ in ml hydrogen/min.sq.cm.

% D	ρ
0	2.59
30	2.48
50	2.11
75	1.96
90	1.83
99	1.63

2. *Aluminium.* Johnston and Davies¹ have reported some preliminary observations on reaction rates of aluminium with 4.5 N sulphuric acid at 50° C. The present investigations on aluminium began with repetition of the experiment reported in¹. High purity aluminium wire was used. The

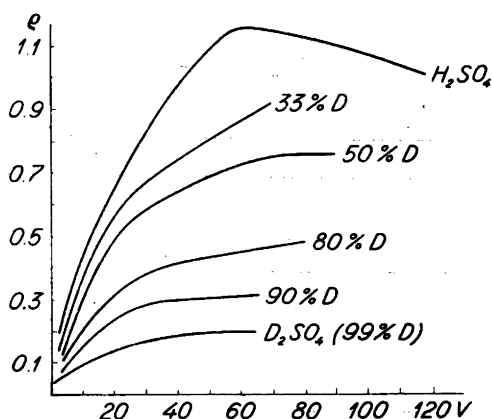


Fig. 1.

ρ denotes ml hydrogen developed per min. and sq. cm. metal surface, thus representing the dissolving velocity.
 V denotes ml hydrogen liberated since the beginning of an experiment, thus representing the quantity of zinc dissolved.

Table 2. Dissolving velocity ρ of aluminium, in ml hydrogen per hour. T denotes time in hours elapsed since the beginning of an experiment.

4.5 N sulphuric acid (50° C)		4.5 N hydrochloric acid (25° C)		2 N potassium hydroxide (25° C)	
T.	ρ	T.	ρ	T.	ρ
	H_2SO_4		HCl		KOH
2	1.25	0.25	4.7	0.04	12.6
25	0.30	1.7	2.3	0.45	8.4
40	0.29	35	0.15	1.1	8.4
	30 % D.	35	0.15		
2.8	0.73	0.3	13.5	0.05	10.2
25	0.24	1.6	3.0	0.57	7.2
45	0.24	35	0.16	0.9	7.2
	50 % D.	56	0.17		
3	0.80		99 % D.	0.04	7
37	0.21	0.35	22.7	0.55	6.2
46	0.23	1.4	4.8	0.88	6.1
	70 % D.	34	0.4		
2.7	0.9	56	0.33	0.04	8.8
28	0.2			0.52	5.6
52	0.2			0.74	5.5
	99 % D.				
2	0.7			0.04	7.8
25	0.15			0.94	4.6
52	0.145			1.8	4.5
					98 % D.

Table 3.

η denotes overvoltage in millivolts.
C. D. » current density (amp/sq.cm.)

	% D.	C.D.	η
Copper in 1 N hydrochloric acid	0	10 ⁻³	525
	75		546
	99.5		587
Nickel in 1 N hydrochloric acid	0	»	178
	30		186
	50		209
	75		235
	99.5		260
Lead in 1 N hydrochloric acid	0	»	1 044
	50		1 088
	80		1 127
	99.5		1 175
Iron in N potassium hydroxide	0	»	170
	50		188
	80		232
	98		269
Mercury in 0.2 N sulphuric acid	0	10 ⁻⁴	828
	50		831
	80		894
	99.5		903

observations showed satisfactory agreement with the results reported in ¹. Some mean values are given in Table 2.

Experiments with aluminium in 4.5 N hydrochloric acid at 25° C gave the surprising result that the reaction rate was much higher with DCl (99 % D) than with HCl. Some mean values are given in Table 2. Similar results were obtained with 2 N hydrochloric acid.

Further a number of observations were made on the dissolving velocity of aluminium in 2 N potassium hydroxide. Some mean values are given in Table 2.

3. *Iron*. Experiments with commercial mild steel and high purity iron in 2 N hydrochloric acid also showed a marked reducing effect of the deuterium content on the dissolving rate.

Measurements of overvoltage. In the present work are included measurements on mercury, copper, nickel, lead and iron at 25° C.

Some mean values from the overvoltage-C. D. curves are tabulated in Table 3.

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Molecular Configuration of 1,2-Dichloro-4,5-Dibromocyclohexane ($\epsilon\epsilon-\kappa\kappa \rightleftharpoons \kappa\kappa-\epsilon\epsilon$) in the Vapour State

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Some months ago the 1,2-dichloro-4,5-dibromocyclohexane corresponding to the 1,2,4,5-tetrachlorocyclohexane of m.p. 176° C and the tetrabromocyclohexane of m.p. 187° C was prepared in our laboratory¹. We wanted to decide which of the two possible configurations is the energetically preferred one, that in which the chlorine atoms occupy κ positions and the bromine atoms ϵ positions or the reversed configuration (Fig. 1).

The substance (m.p. 171°) turned out to crystallize isomorphous with the two substances mentioned above, the only element of symmetry required by the space group being a two-fold axis of symmetry. An X-Ray investigation, the result of which is now being published in this journal², showed the chlorine atoms to be in ϵ positions and the bromine atoms in κ positions (Fig. 1 a).

Although this result seemed entirely acceptable from a theoretical point of view, the objection could be raised that the