

Citation:

E. Cohen, On the velocity of electrical Reaction. II, in:
KNAW, Proceedings, 1, 1898-1899, Amsterdam, 1899, pp. 417-420

Magnet. field.	Percentage value of long. effect.	Percentage increase of resistance.	Ratio.
2800	1,01	7,0	0,14
4720	2,57	14,7	0,18
9480	11,00	3,55	0,31

That nothing can be seen here of the proportionality found by me, may probably be ascribed to some extent to errors of observation; the more so, as the object of the measurements was not to determine the relation between the strength of the magnetic field and the two phenomena, but to compare the behaviour of bismuth with that of bismuth-tin alloys.

Moreover their bismuth was cast. Therefore disturbances, caused by irregular crystallisation were probably present.

Chemistry. — Professor BAKHUIS ROOZEBOOM presents a communication by Dr. ERNST COHEN, "*On the velocity of electrical Reaction. II.*"

The velocity of the reaction $Zn + Hg_2SO_4 \rightleftharpoons Hg_2 + ZnSO_4$.

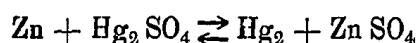
I. An open galvanic element is not a system in equilibrium; this is obvious from the fact that if the circuit of such an element is closed by means of a wire, the reaction which can take place in the cell at once occurs.

We must assume, that, owing to the resistance of an open cell being very (infinitely) great, the velocity of the reaction is practically reduced to zero¹⁾.

2. If, on the other hand, it is, for example, desired to study the course of a chemical reaction at different temperatures as a function of the temperature, a galvanic element may be constructed in which the reaction will take place as soon as the circuit is closed.

In what follows I shall describe briefly the results obtained in the study of the reaction

¹⁾ Compare NERNST, Theor. Chemie. 2e Aufl. 1898, 658.



at different temperatures.

The reaction represented by the above equation takes place in a CLARK-cell when its circuit is closed.

When the cell is short-circuited by a short, thick wire (whose resistance is practically zero) the constant of the electrical velocity of reaction (see my first communication) at t° is

$$K_1 = \frac{E}{\Omega},$$

where E is the electromotive force of the cell at t° and Ω the specific resistance of the saturated solution of zinc sulphate in the cell at the same temperature.

According as the solid substance present is $\text{Zn SO}_4 \cdot 7 \text{H}_2\text{O}$ or $\text{Zn SO}_4 \cdot 6 \text{H}_2\text{O}$, we shall find at one and the same temperature, two values for K_1 since both E and Ω depend on the nature of the solid phase.

3. JAEGER ¹⁾ has found that for an element in which the stable solid phase is $\text{Zn SO}_4 \cdot 7 \text{H}_2\text{O}$, the electromotive force at the temperature t° may be represented by:

$$E_t = 1.400 - 0,00152(t-39) - 0,000007(t-39)^2 \text{ Volts.}$$

If, however, the solid phase is $\text{Zn SO}_4 \cdot 6 \text{H}_2\text{O}$, we have

$$E'_t = 1.400 - 0,00102(t-39) - 0,000004(t-39)^2 \text{ Volts}$$

I have determined the resistance of the different solutions by means of a KOHLRAUSCH dipping-electrode ²⁾ (*Tauchelectrode*) the resistance capacity of which, at 18° , was determined by a 0.5 N. KCl solution, and controlled by a 0.5 N. NaCl solution at the same temperature.

Table I contains the values of E , Ω , and K_1 for the case that $\text{Zn SO}_4 \cdot 7 \text{H}_2\text{O}$ is present in the element and Table II, the same quantities for $\text{Zn SO}_4 \cdot 6 \text{H}_2\text{O}$.

¹⁾ WIED. Ann. Bd. 63 (1897) 354.

²⁾ KOHLRAUSCH a. HOLBORN, Das Leitvermögen der Electrolyte. (Leipzig 1898). p. 18 u. 19.

T A B L E I.

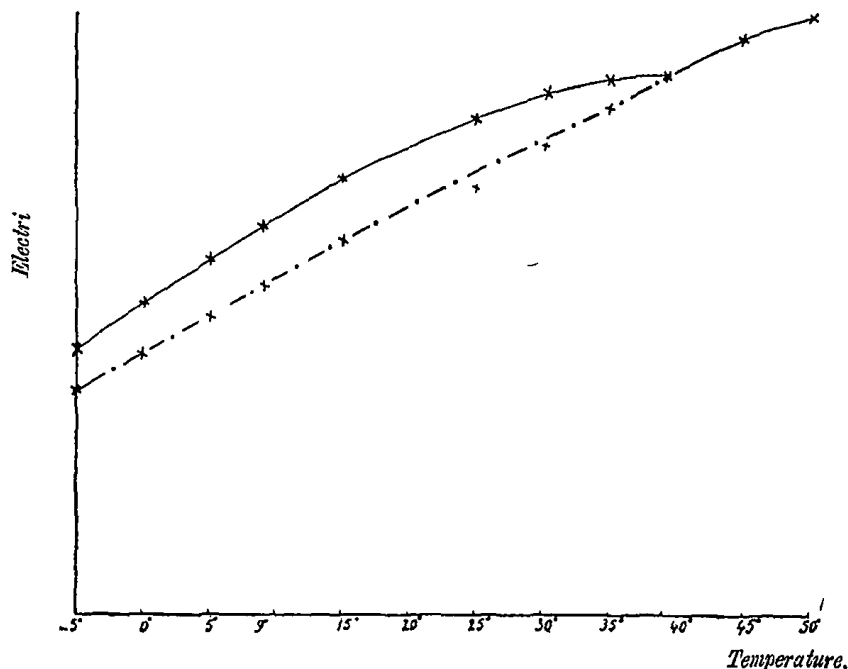
Temperature	E (Millivolts).	Ω	$K_1 \times 10^{-2}$
— 5°.	1453.3	0.0491	296.0
0°.	1448.6	0.0423	342.0
5°.	1443.6	0.0371	388.5
9°.	1439.3	0.0337	426.6
15°.	1432.5	0.0299	478.3
25°.	1419.9	0.0260	544.6
30°.	1413.1	0.0248	574.2
35°.	1406.0	0.0241	583.6
39°.	1400.0	0.0237	590.9

T A B L E II.

Temperature.	E (Millivolts).	Ω	$K_1 \times 10^{-2}$
— 5°.	1437.1	0.0577	248.7
0°.	1433.7	0.0498	287.8
5°.	1430.1	0.0437	326.8
9°.	1427.0	0.0397	359.5
15°.	1422.2	0.0348	408.5
25°.	1413.5	0.0302	467.5
30°.	1408.9	0.0274	513.8
35°.	1404.0	0.0252	557.3
39°.	1400.0	0.0237	590.9
45°.	1393.7	0.0220	631.8
50°.	1388.3	0.0211	659.0

4. Representing the electrical velocity of reaction graphically as a function of the temperature, the two curves shown in the follo-

wing figure are obtained according as we are dealing with the modification which is stable, or with that which is metastable below 39°.



As to be foreseen, the velocity of reaction at 39° is the same in both cases; below this temperature the reaction in the element containing the stable phase is always the faster (at the same temperature).

Phys. — “*Diffraction of RÖNTGEN Rays*”. By Prof. H. HAGA and Dr. C. H. WIND.

Investigations¹⁾ formerly undertaken in the Groningen Laboratory rendered it already clear that, if X rays are due to vibrations of the ether, their wavelength can be but a few ANGSTRÖM units. In the course of the further enquiry a phenomenon was observed, indicating traces of real diffraction and tending to give a wavelength of one or two ANGSTRÖM units. Now it became possible to perform a new series of experiments under circumstances more qualified to exhibit diffraction. A simple consideration makes it clear that in order to obtain great intensity it is better to use narrow slits than to make the distances great.

¹⁾ C. H. WIND, “On the influence of the dimensions of the source of light in diffraction phenomena of FRESNEL and on the diffraction of X rays”. Kon. Akad. van Wetenschappen. Proceedings, June 1898.