XIV. On the dissociation degree of some electrolytes at 0°

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magnetizing coil about the sample for that current, and by direct proportion between horizontal displacement in calibration, and the horizontal displacement of any point on the curve, we obtain in Absolute Units the magnetic force corresponding to any point on the curve. Having thus calibrated the curves of either continuous or alternating current magnetic cycles in Absolute Units, the energy losses, $\int IdH$, may be obtained by taking the area of the curves in the usual way.

Although this description has only been concerned with the curve-tracer as a means of measuring the magnetic quality of, and the energy losses in iron and other metals, when carried through magnetic cycles, it plainly lends itself to such operations as direct tracing of alternating-current and electromotive-force curves, the investigation of the nature and amount of iron losses in alternating-current transformers, the measurement of the power in any electrical circuit, &c.

XIV. *On the Dissociation Degree of some Electrolytes at 0°.*
By R. W. WOOD*.

THE values obtained by the lowering of the freezing-point for the dissociation-degree of dissolved electrolytes are always a little smaller than those calculated from the electrical conductivity.

Meyer Wildermann† has recently lessened the difference by the use of a more accurate method for the freezing-point determinations, and has expressed the opinion that the cause of the discrepancies lay in the fact that the electrical conductivities have been determined at a higher temperature (18°–25°).

At Prof. Jahn's suggestion, I have determined the conductivity of certain Salts and Acids in solutions of varying concentration at 0°, for the purpose of reckoning the Dissociation-degree at this temperature, and the results indicate that, in dilute solutions, the dissociation-degree is practically independent of the temperature.

The determinations were made according to the Kohlrausch method, and the conductivity of the distilled water used in the experiments was determined at different temperatures and taken into account.

The value expressing the conductivity of infinitely dilute

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† Phil. Mag. July 1895.

solutions was calculated by means of the temperature-coefficient from the values found by Kohlrausch and Ostwald for 18° and 25°.

In the case of the acids, it was determined by the aid of the Kohlrausch law.

The results of the determinations made with potassium and sodium chloride are as follows :—

Potassium Chloride 0°.			Sodium Chloride 0°.		
V.	λ.	$\frac{\lambda_v}{\lambda_\infty}$	V.	λ.	$\frac{\lambda_v}{\lambda_\infty}$
1	61.10	78.53	1	44.59	68.60
2	62.49	80.30	2	48.00	73.85
4	64.46	82.78	4	50.76	78.09
8	66.47	85.44	8	53.31	82.02
16	68.70	88.30	16	55.36	85.17
32	70.66	90.82	32	57.20	88.00
64	72.60	93.32	64	59.13	90.77
128	73.90	94.99	128	60.10	92.46
256	75.30	96.79	256	61.13	94.06
512	75.90	97.56	512	62.43	96.05
1024	76.35	98.14	1024	63.70	98.00
∞	77.80	100.00	∞	65.00	100.00

V signifies the volume containing a gram-molecular weight of the salt, λ the conductivity, and $\frac{\lambda_v}{\lambda_\infty}$ the dissociation-degree.

If we take as ordinates the values obtained by Kohlrausch for the dissociation-degree at 18°, and those which I have

found for 0°, and as abscissæ the values of V , we find that the curves are almost coincident, while the one representing the values obtained by Wildermann from the lowering of the freezing-point runs considerably lower, as the diagram indicates.

The values of λ_∞ for 0° in the following table is calculated by means of the temperature-coefficient of the most dilute of the investigated solutions from the values of λ_∞ given by Ostwald for 25°.

For di- and trichloroacetic acids the following values were found:—

Dichloroacetic Acid, $\frac{1}{\lambda} \frac{d\lambda}{dT} = 0.0148$.						
V.	λ for 0°.	$\frac{\lambda_v}{\lambda_\infty}$ for 0°.	λ for 25°.		$\frac{\lambda_v}{\lambda_\infty}$ for 25°.	Dissociation- degree by lowering of freezing- point.
			Wood.	Ostwald.		
32	174	76.6	252.3	253.1	70.2	74.0 84.0
64	194.2	85.5	—	290.7	80.5	
128	207.9	91.5	317.4	317.5	88.0	
256	216.1	95.2	—	337.0	93.4	
512	221.9	97.7	351.8	352.2	97.6	
∞	227.0	100.0	—	361.0	100.0	
Trichloroacetic Acid, $\frac{1}{\lambda} \frac{d\lambda}{dT} = 0.0149$.						
32	206.0	91.7	324.0	323.0	90.1	88.1
64	211.9	94.3	333.5	332.8	93.0	94.0
128	216.6	96.4	341.5	341.0	95.3	
256	219.7	97.7	348.1	348.0	97.0	
512	221.9	98.7	353.0	353.7	98.8	
∞	224.7	100.0	—	358.0	100.0	

For control, the conductivity of the two acids at infinite dilution at 0° was calculated from the values obtained for $\frac{1}{512}$ normal solutions of their potassium salts, potassium chloride, and hydrochloric acid, according to the Kohlrausch law. The following are the values found, which agree very well with those in the table:—

Dichloroacetic acid . $\lambda_\infty = 228$.
Trichloroacetic acid . $\lambda_\infty = 225.2$

The dissociation-degree of the two acids is apparently

independent of the temperature, and Wildermann's supposition has not been confirmed. The deviations of the values for the dissociation-degree calculated by the two methods still remain.

In all probability the cause lies in the inexact determination of the freezing-point of dilute solutions. We know from the investigations of Nernst and Abegg* that its exact determination is attended with great difficulty.

XV. *The Duration of the Flash of Exploding Oxyhydrogen.*

By R. W. WOOD †.

SOME time ago, in endeavouring to photograph the explosion-wave, if it may be so termed, of electrolytic gas by means of the electric spark, I was struck with the fact that the duration of the flash was exceedingly small. In many cases I found that the glass bulbs, which were thinner than paper, were photographed by the light of the incandescent gas within before the walls had given way. The striations on the glass were sharp and the outlines of the bulb were perfectly distinct, the interior being quite filled with a bright glow.

I have recently repeated and enlarged somewhat on these experiments with a view to determine the duration of the flash.

The bulbs were blown very thin, with a quill-like neck at each end. They were filled with a mixture of oxygen and hydrogen by means of an electrolytic apparatus, and two copper wires were then sealed in with wax, with a gap of perhaps half a millimetre between them.

A pendulum, made by hanging a heavy lead ball on a fine wire, was hung in front of the bulb, the copper wires of which were connected with the terminals of a small inductorium.

From the bottom of the ball projected a pin which came in contact with a slip of platinum foil mounted edgewise before the bulb, and the pendulum and foil were put in circuit with the primary coil of the inductorium. This arrangement insured the explosion of the bulb at the moment when the pendulum passed its point of equilibrium, and by calculating the velocity of the pin's head and measuring the amount of blur of the photographic image the duration of the flash could be approximately determined. The camera, provided with a Zeiss lens of large aperture, was placed near enough

* *Zeitschr. für phys. Chem.*, xv. p. 681 (1894).

† Communicated by the Author.