13. Study on Surface Electricity. (VIII)
Measurement of Streaming Potential by Vibration Method. (2)

Shizuo Ueda, Akira Watanabe and *Fukuju Tsuji.*

In the preceding papar we related to a new method for the measurement of streaming potential as one of the applications of " U-effect I ". But the experiment related gave only its possibility and had may defects on its practical devices, so that we have improved it in the following manner.

(1) Vibrating element.

In the former device we used an element of glass capillary filled with liquid in which Cu-electrodes were inserted tangentially from the both ends and sealed with rubber cement. But this time we used an element filled with liquid in which Pt –electrodes were inserted vertically from the capillary wall, and a fine glass pole was inserted from one end of the capillary in order to prevent the vibration of liquid in compliance with the vibration of the capillary wall. " Telex " glass was used.

(2) Amplitude of vibration.

The amplitude of mechanical vibration was represented by the measure of the valve voltmeter connected parallel to the moving coil.

(3) Amplifier.

We observed the frequency character of the amplifier.

(4) Streaming potential.

In the older device we measured the streaming potential by the height of the wave observed on the plate of the cathode ray oscillograph. Here we made a peak–voltmeter (UX 514) and measured the streaming potential by this arrangement.

With these improvements we measured the streaming potential of glass–KCl aq. interface in various concentration and also at various amplitude of vibration.

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14. Study on Surface Electricity. (IX)
Capacity Measurement at Mercury–solution Interface
by Impedance Matching Method. (1)

Shizuo Ueda, Akira Watanabe and *Fukuju Tsuji.*

Various methods of capacity measurement at mercury–solution interfaces have been already deviced. The representative ones among them are calculation method of the second derivative of the electrocapillary curve, impedance bridge method and calculation method from the direct measurement of the charging current of the electrical double layer of increasing interface.

We stated " U-effect II " in the previous paper. When we apply the " maximum power transfer theorem " (Impedance matching) to this, a new method of capacity measurement can be introduced. When, generating an alternating current by the mechanical vibration of mercury-solution interface in a glass capillary (this we call " element ") ...... U-effect II ......, we change the load impedance, we can observe a peak in the power-load curve, where " power " means what is supplied to the load by the vibrating element. According to the maximum power transfer theorem, the inner impedance of the element and the outer impedance of the load have the same absolute value at this maximum. From this value we calculate the capacity of the interface.

With this method we measured the capacity of mercury-norm. H_2SO_4 aq. interface to be 20.24 μF/cm^2. and that of mercury-norm. KCl aq. interface to be 16.02 μF/cm^2.

As the alternating voltage is generated by the charging and discharging of the periodically changing interface, we do not polarize the interface by an outer electromotive force. This is why our method is quite different from the impedance bridge method, in which case capacity observed is the differential capacity, because the alternating electromotive force in the circuit polarized the interface periodically. Our method is also different from the direct method, because the charging and discharging current are not measured directly. Accordingly we can research the interfacial structure from the view-point of circuit theory by this method.

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15. Study on High Dielectric Constant Ceramics. (VI)
Polarization of BaTiO$_3$ Ceramics.

Kiyoshi Abe and *Tetsuro Tanaka.*

Various values regarding the polarization of BaTiO$_3$ ceramics can be obtained from the static measurement by a ballistic galvanometer under proper conditions, as well as the dynamical method by a Braun tube oscilloscope. It is necessary, in these static method, to remove completely the hysteresis of BaTiO$_3$ specimen before measurement, to get reproducible values of polarization. The hysteresis, however, is easily removed when the sample is heated above its Curie point, and both electrodes are short-circuited. Then the dielectric polarization Pc and Pd which correspond to charging and discharging quantity respectively, and residual polarization Pc-Pd, can be readily obtained. It is also possible to get residual polarization directly from the measurement of exhausted electricity when the specimen is rapidly heated above its Curie point. The measured value of residual polarization Pr by this method usually shows fairly good agreement with that of Pc-Pd.