

50. On Some Device of the Gas Leak Apparatus for Measuring the Pumping Speed.

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The pumping speed of the diffusion pump for various gases were measured by evacuating the gas reservoir through the porcelain of constant conductance. The leaking quantity and the vacuum pressure were easily obtained and consequently the pumping speed was given.

When the gas leaks through the porcelain of conductance G from the vessel of volume V and of the initial pressure p_0 , its pressure p after time t is shown as

$$p = p_0 \exp(-Gt/V),$$

and the leaking quantity q also decreases exponentially as

$$q = G \exp(-Gt/V).$$

Denoting the vacuum pressure of the diffusion pump side as p , the pumping speed Q is given by the following relation.

$$Q \cdot P = G \cdot p = q \cdot p.$$

By using the leak apparatus which satisfies the above mentioned conditions the speed at different pressures could be measured by several hours' run of the experiment.

For example, a diffusion pump had the speed of about 19 liters per sec. in the range of $1.2 \times 10^{-3} \sim 5.0 \times 10^{-4}$ mm Hg, but this began to fall at the neighbour of 4×10^{-4} mm Hg.

In addition, the relation between the speed and the different heater input was obtained under the constant pressure in the gas vessel, which showed a comparatively narrow range for its high pumping speed.

51. Study on Clay. (III)

Dielectric Properties of Mud Pastes under Alternating Field of Low Frequency.

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The capacity between the nickel parallel plate electrodes inserted in mud was measured by the bridge method.

Under very slowly alternating field, i. e., below 1 kc, water itself had a large d. k. due to its slight impurities. This phenomenon was confirmed by the d. k. measurements of KCl aqueous solutions of various densities. The ratios of the d. k. of the pastes to that of KCl aqueous solution with the same conductivity were obtained by taking into account the increase of d. k. due to the ions. The results are shown in Table I.

Sample	Volume Concentration	Ratio to the d. k. of water at							
		60	180	420	1.1×10^3	4.0×10^3	1.7×10^4	3.4×10^4	6.0×10^4 cps.
Kato Kaolin (upper part)	0.159	—	3.4	4.3	11	13	10	7.5	6
Kato Kaolin (lower part)	0.323	—	7.4	9.3	15	21	8	7	6
Fukushima-Silica	0.510	1.1	1.5	1.5	1.5	0.5	0.4	0.4	0.3
ZnO	0.08	0.8	1.1	1.1	1.5	1.1	1.0	1.0	1.0

When the Kato Kaolin was suspended and sedimentated in water, upper and lower sediments of different colour were obtained. The "upper part" and the "lower part" in this table mean the upper and lower sediments.

The Kato Kaolin mud showed larger d. k. than that of the water in all frequency range, while the mud made from the Fukushima Silica showed smaller d. k. than that of the water in the range of frequencies larger than 4 kc.

Since the d. k. of the Kato Kaolin powder desicated for a long time at 110°C, was ca. 5, it was noticeable that the Kaolin mud had larger d. k. than that of its two components.

Conclusions: when the silica powder is mixed with water, both are mutually independent, while clay and water have mutual interactions of some kind, and these interactions may cause the plasticity of clay paste.

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52. The Quantitative Determination of Chromium in Sea Water.

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Chromium has been detected by some investigators in marine organisms, but no one determined in sea-water. In the present work, the authors have found Cr in sea-water spectroscopically and quantified it by colorimetry, using diphenylcarbazide as the reagent.