freq. (cps.)	2,500	3,000	5,000	6,000
1/freq.^{2}	1.6	11.11	4.00	$2.78 \cdot 10^{-4}$
L_0 (mh)	158	109.5	41	28.5

From the last equation, L_0 must be inversely proportional to the square of the frequency, which can easily be shown from the figures in this table.

Now, in our effect the capacitance is not constant, but, changes with time according to the equation $c = K + \Delta C\ \epsilon^{j\omega t}$. In the derivation of the equation of U-effect II in the last paper, we assumed that $\Delta c/K \ll 1$ held for our effect. To ascertain whether this assumption can be used or not, we measured the values of L_0 with different values of Δc, which could be controlled by the input voltage of the vibrator. The results were

Vibrator input	L_0	I_0
100	142 mh	104.2
20	142	68
10	142	33.9
5	142	8.5
3	142	2.5

In this experiment the frequency of vibration was 2,500 cps. It is clear that the resonance occurred with the same value of L_0 despite of Δc within the values of Δc in our experiment.

While the impedance matching method described in the past by the same authors required two independent measurements of current and voltage, the one here described includes only a measurement of current with various inductances, which is the superiority of this method in its simplicity of operation. In addition, the easiness in obtaining the maximum point of current enables this method the better measurement for the interfacial capacity among the many devices, *e. g.* the impedance bride method and others.

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9. Study on Surface Electricity. (XVIII)

On the Q-value of Interfaces

Akira WATANABE, Fukuju TSUJI, Kazuo NISHIZAWA and Shizuo UEDA

(Tachi Laboratory)

A resonance circuit has a characteristic value, called "Quality factor" or "Q-value", which is the ratio of the reactance and resistance components, defined by

$$Q = \omega L_0/(R_0+R) = 1/[\omega K(R_0+R)].$$

Accordingly, we can guess the constitution of interfacial phase from the estimation of this value, ωL_0 being calculated from resonance method.

On the other hand, Q is a measure of the sharpness of the resonance curve, *i. e.* it is calculated from the equation,

$$Q = \frac{L_1 + L_2}{L_1 - L_2}$$

where L_1 and L_2 are the values of the inductance when the current of the circuit I satisfies the equation

$$I = I_0/\sqrt{2},$$

I_0 being that value at resonance. Hence, we can calculate the values of Q from the graphical analysis of the resonance curves. The measurement of Q-value at 2,500 cps., at various I_0, which is considered to be proportional to Δc, gave the following results;

Vibrator input	I_0	Q
100	104.2	2.01
20	68.0	2.27
10	33.9	2.61
5	8.5	3.36
3	2.5	3.83

Apparently, Q-value increased as Δc decreased. This can be interpreted by the following consideration. As this circuit contains periodically changing capacitance, it is a sort of frequency modulation circuit, in which the carrier frequency equals the signal frequency. Hence, the inductance at resonance L_0 changes with it by

$$\Delta L_0 = L_0 \ (\Delta c/K),$$

which induces the decrease in the apparent Q-value, calculated from the analysis of the resonance curves. Hence, the true value of Q is given by

$$\lim_{\Delta c \to 0} Q.$$

Another device of Q-measurement can be obtained from the principle of the so-called "Q-meter". This denotes that the Q-value of this circuit is given by

$$Q = E_c/V,$$

where V is the emf. of U-effect II and E_c the potential difference at the condenser at resonance. The value of Q so obtained is independent of Δc and can be used for the more accurate estimation of this value.

10. Protective Power of Surfactants for Dyestuffs

Rempei GOTO, Takeo SUGANO and Naomi HAYAMA

(Goto Laboratory)

In order to investigate protective power of surfactants for dyestuffs,