the other hand, another tendency occurs; at room temperature, resistivity increases with voltage increase. This phenomenon is explained by the facts that domains are lined up along the direction of the field in accordance with the field intensity, and the resistivity along the polarization axis is larger than that of another axis. It is also explained by the decrease of effective field in crystal due to the orientation of domains along the direction of the field.

17. On the Dielectric Properties of Starch. (II)

The Complex Dielectric Constant at High Frequency.

Naokazu Koizumi, Sozaburo Ono and Takashi Kuge.

The dielectric constant ε' and loss ε'' of the starch-liquid paraffin system at the frequencies from 3 MC to 30 MC were measured with the susceptance variation method at the temperature range from 10° to 55°C.

The samples were both α- and β-modifications of various starches (potato, waxy rice, lily bulb and amylose etc.), and were preparen in the same way as in the preceding report. (This Bulletin, **20** 46 (1950))

The maximum value of loss ε''_{MAX} appeared at a given temperature or frequency corresponding to moisture content, and the increase of moisture shifted ε''_{MAX} to lower temperature at a given frequency and to higher frevuency at a given temperature.

Moreover the dispersion curve for zero moisture percentage was very similar to the one for lower percentage. Any remarkable difference was neither found among the sorts of starch, nor between the both modifications.

According to the theory of absolute reaction rates the free energy $\Delta F^{\ddagger}$, heat $\Delta H^{\ddagger}$ and entropy $\Delta S^{\ddagger}$ of activation in the dielectric relaxation process were evaluated from the temperature dependence of relaxation time, and approximate values of them are as follow.

Moisture content (in%)	Relaxation time $\bar{\tau}$ at 20°C (in second)
0	1.10^{-7}
10	1.10^{-8}
16—17	1.10^{-9}

$\Delta F^{\ddagger}$ 6~8 Kcal/mol
$\Delta H^{\ddagger}$ 7~11 Kcal/mol
$\Delta S^{\ddagger}$ 5~10 e. u.

Because the number of H_2O molecule loosely bound with starch becomes more in case of higher moisture percentage, it is reasonable that the more the moisture content, the smaller the value of mean reluxation time $\bar{\tau}$, and that the larger values of $\Delta F^{\ddagger}$ and $\Delta H^{\ddagger}$ correspond to lower moisture content and the smaller values to higher content.

From the above results it may be considered that the dispersion of dielectric constant in the starch-liquid paraffin system at ultra high frequency and high frequency is due to the rotation of dipole of hydroxyl group in water and starch molecules.