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11. Studies on Silicone Resins. (XII)

On the Dielectric Properites. (3)

Kiyoshi Abe, *Minoru Toyoda* and *Yoshinao Iida*

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In this Bulletin (**25**, 57, 1951), we pointed out that the OH radical would play the part of dipolar radicals in the silicone resin.

In this report, the relation between static dielectric constant and number of OH radical of silicone resin are discussed.

Since the viscosity of the sample is very high, a conical electrode for measuring dielectric constant has been designed. The number of OH radical in silicone resin is measured from the next chemical reaction: the OH radical in organosiloxane reacts with CH_3MgI and produces CH_4 which is quantitatively measured.

When resin is cured at low temperature, its static dielectric constant varies with the number of OH radical, but on the static dielectric constant of the resin cured at high temperature, it is hard to have certain relation to the number of OH radical. At a certain number of OH radical its static dielectric constant begins to decrease rapidly, while decrease of OH radical is few. On the other hand the relation between the number of OH radical and the decrease of weight was investigated, and it was found that when the resin was cured at high temperature, the above-mentioned relation coinsides fairly well with the theoretical relation in poly-condensation process, but when it was cured at low temperature, the degree of weight decrease became larger than the theoretical value. This phenomenon will give a key to the investigation on the oxidation of silicon resin. And it is considered that the decreases of weight and static dielectric constant are due to the decomposition of arkyl radical.

We wish to acknowledge the aid of Mr. I. Shiihara and K. Niibayashi of Japan Silicone Resin Co. Ltd. who have measured the quantity of OH radical.

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12. Studies on Silicone Resins. (XIII)

On the Dielectric Properties. (4)

Kiyoshi Abe and *Minoru Toyoda*

(Abe Laboratory)

In this report, the temperature characteristics of dielectric loss of silicone

resin are discussed.

1. Relation between "R/si" and dielectric properties. (R: Organic radical).

(1) The relation between R/si and temperature at which loss angle became maximum, was already reported in the last paper (this Bulletin 26, 76, 1951). After then this relation has been investigated in detail and it is found that when the maximum values of loss angle are same, the temperature at which loss angle is maximum, is nearly proportional to R/si at the same frequency.

(2) It is also found that in the resin whose R/si is small, the anomalous dispersion which is considered to be due to OH radical, occurs as in the other resin, and that in this resin another anomalous dispersion appears at lower temperature.

It is considered that this phenomenon is due to the bound water which is produced in poly-condensation process.

2. Relation between the kind of organic radical and dielectric properties.

(1) The aryl silicon resin shows smaller variation of the temperature, at which loss angle is maximum, with R/si than that of alkyl silicon resin.

It is considered that aryl radicals in silicon resin may prevent a siloxane bridge formation, therefore the above-mentioned phenomenon appears.

(2) The effect of frequency upon the temperature characteristics of dielectric properties of aryl silicon resin is different from that of alkyl silicon resin.

At temperature lower than that at which loss angle is maximum, frequency gives little effects upon the dielectric properties of the aryl silicon resin.

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13. Studies on Micro-Crystals by Electron Microdiffraction (Preliminary Report)

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It had been very difficult to identify the material under examination with the electron microscope. Though electron diffraction method is a very simple one for this purpose, we could not observe directly the portion of the specimen at which the diffraction took place. The electron microscope, however, which had three electron lenses for magnifying system was constructed lately, by which we could realize the use of the above mentioned two methods, i. e. electron micrograph and diffraction at the same time with the same apparatus. Such an electron microscope has two projection lenses : one as interme