Title	Study on the Roller Chain Link Plate by the Photo-elastic Method
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pump having a single oil jet was about 180 litre/sec for hydrogen at 1200 watts heater imput and that for duterium about 130 litre/sec at 800 watts. At the normal rating the theoretical ratio of the pumping speed of hydrogen to duterium is $\sqrt{2}$, but our experiments showed about 1. This discrepancy was considered to be due to the back diffusion of light gases.

Speed factors for hydrogen and duterium were calculated as 0.093 and 0.081 respectively which showed bad design of the diffusion pump.

We conceived also that the auxiliary diffusion pumps improved the decreasing pumping speed especially at high vacuum.

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9. Study on the Roller Chain Link Plate by the Photo-elastic Method

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We fitted a pin (or bush) in each of the two holes of a roller chain link plate and observed it by the photo-elastic method, changing the radial pressure P at the hole and a tensile weight. As the test piece we used phenolite.

We found, under the condition above mentioned, that the relation between the stress at the hole and the tensile weight was similar to that which was shown by Haessler (Product Eng., May (1941), 263.) between the stress of a bolt and a tensile weight when a piece of rubber was inserted between two bolts. The relation led by him is as follows,

$$T=\{\beta/(\alpha+\beta)\}\ W+C_i \tag{1}$$

where T is the stress of one of the bolts when tensile weight is W; α and β are the elongations of the bolt and the rubber respectively per unit tensile weight; C_i is the initial stress of the bolt. The relation between the maximum shearing stress around the hole and the tensile weight was almost linear (I). The mean tensile stress at the radial cross section passing through the center of the hole and the tensile weight showed a relation similar to eq. (I), but no linearity. This discrepancy seems to be due to a particular deformation process of the link plate.

Then we defined a quantity η, which we named "the coefficient of the share of the stress",

$$\eta_{\text{link plate}}=(T-T_0)/W, \qquad \eta_{\text{pin (bush)}}=(T'-T'_0)/W, \tag{2}$$

where T is the mean tensile stress at the radial cross section under the tensile weight of W and T_0 is the value of T caused by fitting a pin when $W=0$. T' and T'_0 are the coressponding values to T and T_0 at the pin (or bush). From the condition of equilibrium, we obtain

$$\eta_{\text{link plate}} + \eta_{\text{pin (bush)}} = 1. \qquad (3)$$

We found that under the same tensile weight, $\eta_{\text{link plate}}$ decreases as the initial radial pressure P (above mentioned) increases. This shows that the pin (or bush) shares more of the tensile stress as the initial radial pressure P increases, (cf. eq. (3)).

The stress concentration at the narrowest part of the link plate, when a tensile weight is loaded, decreased as the initial radial pressure P increased and reached the value where there were no holes. From this we concluded that the link plate approached the condition, where there were no holes, as the radial pressure P increased.

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10. Studies on Silicone Resins. (VII)

On the Dielectric Properties

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The dielectric properties of methyl-ethyl and methyl-ethyl-phenyl silicone resins for various frequencies and temperatures were measured. From these measured results following facts can be concluded.

(1) These dielectric properties qualitatively obey the Debye theory, namely these phenomena show the existences of dipolar radicals. Quantitatively, however, they considerably deviate from the Debye theory. (2) The higher the measuring frequency the higher the temperature is, at which the dielectric loss angle is max. (3) The changes of dielectric loss angle and constant are slower. (4) As the poly-condensation of silicone resin goes on, its dielectric loss angle and constant become smaller and their changes slower. (5) As it dries, the change of dielectric constant which becomes large as temperature rises, becomes smaller and at last extinguishes. (6) As it dries, the temperature at which the dielectric loss angle is max. becomes higher a little. (7) The temperature characteristics of dielectric loss angle does not show the "V-Curve."

For the above-mentioned items discussions will be given.

On the dipolar radicals, the OH-radical and siloxane bond are considered. As the poly-condensation of the silicone resin goes on, OH-radicals decrease and siloxane bonds increase. And how these two kinds of radicals take part each other in dielectric phenomena, is very interesting.

For the deviation from the Debye theory, applying Cole-Cole's theory the following results can be obtained.

$$\alpha = 0.71, \qquad \varepsilon_0 - \varepsilon_\infty = 0.35$$