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Elastic Behavior of Viscoelastic Liquid

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This research was done in order to pursue the physical meaning of the end correction on the tube length correction term coefficient, which has been introduced empirically for the analysis of the capillary flow of the high polymer solution or melt.

1) The measurement of the pressure distribution along the die axis:

The direct determination of the pressure distribution along the die axis has the most significant meaning not only to clarify the physical meaning of the end correction but also to reveal the elasticity effect in the steady state flow of viscoelastic liquid.

a) The pressure distribution is linear within the experimental precision. This fact proves that the relaxation phenomena in the die is negligible.

b) The existence of residual pressure at the die exit can predict the existence of the normal stress along the die axis.

c) The shear stress calculated from the gradient of the pressure distribution is 2 to 7 % greater than that measured by the capillary viscometer. This fact proves the existence of elastic shear stress presumed by Arai.

2) The relation of the tube length correction term coefficient and the shape of duct:

(In order to calculate the elasticity effect of two dimensional axial flow with arbitrary sectional shape, the following *a*) assumption was made.)

a) The tube length correction term coefficient coresponds to the value calculated by the integration of the elastic work at each point over the sectional area and the elastic work is determined only by the state of simple shear.

b) The relation of the duct length correction term coefficient between capillary flow and slit flow.

c) The duct length correction term coefficient of rectangular duct and the numerical solution of it.

d) The experimental examination of the *a*), *b*), *c*).

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