Article ID: 1003-7837(2005)02,03-0216-01

A deformability of carbon plastics based on the phenylone

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The theory of rubber high elasticity gives the following expression for estimation of limiting draw ratio λ_f of elastomers:

$$\lambda_f = \sqrt{n_x} \tag{1}$$

where n_x is the number of statistical segments on the chain part between chemical cross-linking nodes or physical entanglements.

For an application of the considered conception to glassy polymers usually a number of empirical assumptions accounting for considerably stronger intermolecular interactions in such systems are made. Edwards and Vilgis offered sliding links conception, which assumes the division of the chain between entanglements on smaller fragments which are fixed, but have considerable internal freedom. This results in the decrease of polymers limiting strain in comparison with the estimated one according to the equation (1).

Within the framework of fractal analysis the relationship for calculation of value for polymeric materials was obtained:

$$\lambda_f = C_\infty^{D-1} \tag{2}$$

where C_∞ is characteristic ratio which is an indicator of polymeric chain statistical rigidity, D is fractal dimension of chain part between its fixation points (chemical cross-linking nodes, physical entanglements and so on). The value D is varied in the limits 1-2 and characterises the molecular mobility level of polymers.

The comparison of experimental and calculated according to the equation (2) values λ_f demostrated their close correspondence. This means, that the fracture of carbon plastics in compression testing is controlled by drawing of chains between clusters and described within the framework of the fractal model.

Received date: 2005-08-29