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THE STRUCTURE AND PROPERTIES OF POLYMERIC MATERIALS(U)
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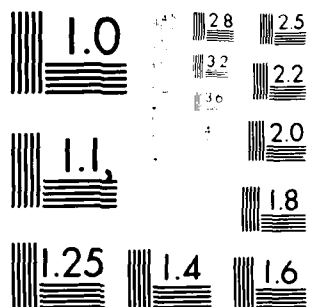


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THE STRUCTURE AND PROPERTIES OF POLYMERIC MATERIALS
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FOR THE PERIOD
1 FEBRUARY 1977 to 30 SEPTEMBER 1981

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SUMMARY OF RESEARCH PROGRESS

Research on the theory of liquid crystalline systems has been continued with special emphasis on systems of semiflexible polymer chains. Experiments on low molecular analogs have been carried out with the primary object of assessing the effects of anisotropic intermolecular forces in effecting stabilization of an anisotropic phase. It has been demonstrated that anisotropy of the molecular polarizability, which can be evaluated by optical measurements of depolarized Rayleigh scattering (DRS), is directly responsible for the effect. The density of the fluid has been found to play an important role, not hitherto recognized. It must be taken into account in any quantitative treatment of liquid crystallinity in low molecular substances at high temperatures.

The theory of rubber elasticity of real polymeric networks has been refined and generalized. In its revised form the theory gives a good account of the relationship of stress to strain for all strains, including biaxial deformations, throughout experimentally accessible ranges. The principal parameter required, apart from the degree of interlinking that characterizes the network structure, appears to be related to the degree of interpenetration in the network. This parameter, too, may be subject to evaluation, also from molecular characteristics. Thus, the theory provides an essential link between molecular structure and properties.

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