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Modelling of Molecular Processes in Creep of an Oriented Linear Crystalline Polymer

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Molecular models of chain slippage and rupture, interrelation of these molecular processes in high-oriented loaded amorphous-crystalline polymer is suggested. It is taken into account complex interaction between slippage and rupture of interconnecting polymer chains. An oriented crystalline polymer with homogeneous chemical structure of type of linear polyethylene is examined. The crystalline polymer is considered as two-phase one with interchanging amorphous and crystalline regions. Using Frenkel-Kontorova's dislocation or soliton models the tension and slippage of macromolecules is considered. According to the molecular model in polymer sample creep the leading elementary process is mechanically stimulation of thermo-fluctuation slippage of interconnecting molecular chains. It is valid for flexible chain polymers at least. The activation energy of the slippage and the thermo-fluctuation rupture of the linear chain is calculated by using Morza's potential for the covalent bond. It is considered conditions thermo-fluctuation interconnection molecular chain rupture. The conditions and molecular creep processes are complexly dependent on load, conformation structure, concentration of chain ends, entanglements and cross -links, and on other molecular and super-molecular parameters of polymer sample.

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