Shear Mechanical Properties of Main Chain and Side Chain Liquid Crystalline Elastomers

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We study the linear shear mechanical properties of several uniaxial nematic Main Chain and Side Chain Liquid Crystalline Elastomers oriented with the director in the plane of the films as a function of temperature, frequency and the cross-linking density, applying the shear deformation in a direction perpendicular or parallel to the director. The technique used is a shear piezoelectric rheometer enabling the complex shear-modulus to be measured in a broad frequency range (from 10^{-1} Hz to a few 10^{3} Hz) for weak imposed strains (10^{-4}).

For the two types of materials, the following points will be discussed and compared: the mechanical anisotropy, the hydrodynamic regime as well as the cross-over to the high frequency regime, the influence of the crosslinking density on the mechanical response. In the case of the Main Chain systems, the influence of the Smectic C clusters revealed by X-rays on the mechanical response will be also considered. Finally, we present the first study of the shear modulus performed on a Side Chain Liquid Crystal Elastomer oriented in the homeotropic geometry, for which the director is perpendicular to the plane of the film.