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Biological Soft Matter Theory

Physics Department TUM

"Soft-Matter Seminar"

Linear viscoelasticity of a single semiflexible polymer chain

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Abstract:
We study the dynamic properties of a single semiflexible polymer chain based on the theoryfor the wormlike-chain model developed by Hallatschek et al. [1]. Firstly, we have investigated the viscoelastic response of a extended single semiflexible polymer chain under oscillatory forces acting at the two chain ends. The complex compliance and the complex modulus are obtained analytically as functions of the oscillation frequency [2,3]. A scaling argument is developed to get understanding of the power-law exponent -7/8 in the high frequency limit [3]. Secondly, the linear viscoelasticity of a semiflexible polymer chain with internal friction is investigated [4]. It is found that the frequency dependence of the complex compliance in the high frequency limit is the same as that of the Voigt model. This asymptotic behavior appears also for the Rouse model with internal friction [5]. Lastly, the dynamics and the linear iscoelasticity of an extended semiflexible polymer chain with intramolecular interaction are studied. It is found that, for the attractive interaction, the uniform state becomes unstable when the stretching external force is weakened and its strength becomes smaller than the threshold value. We also discuss the linear viscoelasticity in the vicinity of this transition point.

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