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Non - equilibrium translocation dynamics of end pulled polymer chains

The translocation dynamics of a polymer chain driven through a nanopore by an external bias between the cis and trans side of the chain is a far from equilibrium process. With the emergence of single molecule techniques, the translocation of a polymer can be studied by applying a mechanical force on one end of the polymer by using an optical or a magnetic tweezer. In this work, we consider the translocation dynamics of a polymer chain pulled through a nanopore with a strong driving force applied at the head end of the chain using Langevin dynamics simulations [1]. The translocation time distribution, the mean translocation time and waiting time distributions are calculated. The waiting time as a function of the monomer number is non-monotonic in nature which clearly indicates that the translocation is a far from equilibrium process. The velocity profile of the monomer at different times shows that translocation process is accompanied by the propagation of tension front along the polymer chain [2]. The distribution of waiting times reaches a maximum when the tension front has propagated to the last monomer bead. Our simulation results are supported by theoretical studies by using the iso- flux tension propagation theory (IFTP) of driven translocation to derive explicit equations of motion for the dynamics [3,4], and include the friction term arising from the trans side of the subchain. The theoretical results are in excellent agreement with the molecular dynamics simulations. We obtain exact analytical expression for the scaling behavior of the average translocation time as a function of the chain length and the exteranal driving force.

[1] Huopaniemi, K. Luo, T. Ala-Nissila, and S. Ying, Phys. Rev. E 75, 061912 (2007).

[2] T. Ikonen, A. Bhattacharya, T. Ala-Nissila and W. Sung, J. Chem. Phys. 137, 085101 (2012).

[3] T. Sakaue, Phys. Rev. E 76, 021803 (2007).

[4] J. Sarabadani, T. Ikonen and T. Ala-Nissila, J. Chem. Phys. 141, 214907 (2014).

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