School of Nano Science

Special Seminar

DNA translocation through a nanopore

Invited Speaker:

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Abstract:

Translocation of a DNA through a nanopore has been suggested as a rapid and cheap method for DNA sequencing. Motivated by that, we study the translocation of a DNA (coarse grained semi-flexible homopolymer) through a nanopore under an external driving force by means of both modified version of the iso-flux tension propagation theory (IFTP), and extensive molecular dynamics (MD) simulations. To properly describe the translocation process, we show that for DNAs with a finite persistence length p the trans side friction must be explicitly taken into account. In addition, knowing R N (the scaling of the end-to-end distance as a function of the DNA length N) is crucial to construct the modified IFTP theory. Therefore, we first derive a semi-analytic scaling form for R N , which reproduces a rod, an ideal chain, and an excluded volume chain limits in the appropriate limits. We then quantitatively characterize the nature of the trans side friction based on MD simulations of DNAs. Augmented with these two factors, the modified IFTP theory shows that there are three main regimes for the scaling of the average translocation time, namely stiff, Gaussian and excluded chain limits. Our results are in good agreement with available simulations and experimental data.

Wednesday, 11 Mordad 1396 (August 2, 2017), 15:00-16:30

Classroom C, Farmanieh Building, IPM