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Forced Translocation of Polymer through Nanopore: Deterministic Model and Simulations YANQIAN WANG, UNC-Chapel Hill, SERGEY PANYUKOV, P. N. Lebedev Phys. Inst., Russ. Acad. of Sci., QI LIAO, Inst. of Chem.,Chin. Acad. of Sci., MICHAEL RUBINSTEIN, UNC-Chapel Hill — We propose a new theoretical model of forced translocation of a polymer chain through a nanopore. We assume that DNA translocation at high fields proceeds too fast for the chain to relax, and thus the chain unravels loop by loop in an almost deterministic way. So the distribution of translocation times of a given monomer is controlled by the initial conformation of the chain (the distribution of its loops). Our model predicts the translocation time of each monomer as an explicit function of initial polymer conformation. We refer to this concept as "fingerprinting". The width of the translocation time distribution is determined by the loop distribution in initial conformation as well as by the thermal fluctuations of the polymer chain during the translocation process. We show that the conformational broadening Δt of translocation times of m-th monomer $\Delta t \propto m^{1.5}$ is stronger than the thermal broadening $\delta t \propto m^{1.25}$ The predictions of our deterministic model were verified by extensive molecular dynamics simulations

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