Title:	Hysteresis loop area scaling exponents in DNA unzipping by a periodic force: A langevin dynamics simulation study.
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Abstract:	Using Langevin dynamics simulations, we study the hysteresis in unzipping of longer double-stranded DNA chains whose ends are subjected to a time-dependent periodic force with frequency ω and amplitude G keeping the other end fixed. We find that the area of the hysteresis loop, A loop , scales as 1 / ω at higher frequencies, whereas it scales as (G − G c) α ω β with exponents α = 1 and β = 1.25 in the low-frequency regime. These values are same as the exponents obtained in Monte Carlo simulation studies of a directed self-avoiding walk model of a homopolymer DNA [R. Kapri, Phys. Rev. E 90, 062719 (2014)], and the block copolymer DNA [R. K. Yadav and R. Kapri, Phys. Rev. E 103, 012413 (2021)] on a square lattice, and differs from the values reported earlier using Langevin dynamics simulation studies on a much shorter DNA hairpins.
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