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Study of unzipping transitions in an adsorbed polymer by a periodic force

Abstract

Using Monte Carlo simulations, we study the dynamic transitions in the unzipping of an adsorbed homogeneous polymer on a surface (or wall). We consider three different types of surfaces. One end of the polymer is always kept anchored, and another end monomer is subjected to a periodic force with frequency ω and amplitude g_0. We observe that the force-distance isotherms show hysteresis loops in all three cases. For all three cases, it is found that the area of the hysteresis loop, A_{loop}, scales as $1/\omega$ in the higher frequency regime, and as $g_0^{\alpha}\omega^{\beta}$ with exponents $\alpha = 1$ and $\beta = 1.25$ in the lower frequency regime. The values of exponents α and β are similar to the exponents obtained in the earlier Monte Carlo simulation studies of DNA chains and a Langevin dynamics simulation study of longer DNA chains.