

Abstract Submitted  
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**Nonequilibrium theory of polymer stretching based on the Master Equation**<sup>1</sup> HANKE FELIX, Dalhousie University, Halifax, NS, Canada, HANS JÜRGEN KREUZER, Dalhousie University, Halifax, NS, Canada — Single polymer pulling experiments such as protein unfolding measurements and dynamic force spectroscopy are increasingly done at high loading rates where equilibrium statistical mechanics is no longer applicable. I will present a theory that takes into account non-equilibrium effects using a Master Equation [PRE v. 72, 031805 (2005)]. If the molecular length is used as a stochastic variable, the transition probabilities have a simple analytic form. This theory predicts significant differences between experimental designs using controlled end-to-end positions and those that utilize a force-control mechanism. The most prominent non-equilibrium effect is a loading rate-dependent hysteresis in the force-extension curve. Molecular relaxation close to and far from equilibrium will also be discussed in the framework of the Master Equation theory.

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