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Free Energy of a Polymer in Slit-Like Confinement across the Odijk, moderate confinement, and Bulk Regimes ALBERT KAMANZI, JASON S. LEITH, McGill University, DAVID SEAN, University of Ottawa, DANIEL BERARD, ANDREW C. GUTHRIE, CHRISTOPHER M.J. MCFAUL, McGill University, GARY W. SLATER, University of Ottawa, HENDRICK W. DE HAAN, University of Ontario, Institute of Technology, SABRINA R. LESLIE, McGill University, MCGILL UNIVERSITY TEAM, UNIVERSITY OF OTTAWA, UNIVERSITY OF ONTARIO COLLABORATION — We directly measure the free energy of confinement for semi-flexible polymers from the nanoscale to bulk regimes in slit-like confinement. We use Convex Lens-induced Confinement (CLiC) microscopy of DNA to load and directly count molecules at equilibrium in a single chamber of smoothly increasing height. CLiC microscopy allows for direct visualization of polymers in free solution over long periods, as a function of tunable vertical confinement - from the millimeter to the nanometer scale, and within a single device. Our direct characterization of the free energy of confinement, across several orders of magnitude of applied confinement, agree with new simulations established in this work. We compare experimental results to the "de Gennes blob model", to theory published by Casassa, as well as to simulations by Chen and Sullivan, in appropriate regimes. This work establishes a robust platform for understanding and manipulating polymers at the nanoscale, with a wide range of applications to biomedical technologies.

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