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Experimental Evidence of Weak Excluded Volume Effects for Nanochannel Confined DNA DAMINI GUPTA, JEREMY J. MILLER, ABHIRAM MURALIDHAR, Chemical Engineering and Materials Science, University of Minnesota, Minneapolis MN, USA, SARA MAHSHID, WALTER REISNER, Physics Department, McGill University, Montreal QC, Canada, KEVIN D. DORFMAN, Chemical Engineering and Materials Science, University of Minnesota, Minneapolis MN, USA — In the classical de Gennes picture of weak polymer nanochannel confinement, the polymer contour is envisioned as divided into a series of isometric blobs. Strong excluded volume interactions are present both within a blob and between blobs. In contrast, for semiflexible polymers like DNA, excluded volume interactions are of borderline strength within a blob but appreciable between blobs, giving rise to a chain description consisting of a string of anisometric blobs. We present experimental validation of this subtle effect of excluded volume for DNA nanochannel confinement by performing measurements of variance in chain extension of T4 DNA molecules as a function of effective nanochannel size (305-453 nm).[1] Additionally, we show an approach to systematically reduce the effect of molecular weight dispersity of DNA samples, a typical experimental artifact, by combining confinement spectroscopy with simulations.

[1]Gupta et al., ACS MacroLett. 4, 759 (2015)

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