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A localized transition in the size variation of circular DNA in nanoslits ELIZABETH A. STRYCHALSKI, SAMUEL M. STAVIS, JON GEIST, National Institute of Standards and Technology — We observe a localized transition in the size variation of circular DNA between strong and moderate regimes of nanofluidic slitlike confinement. We applied a rigorous statistical analysis to our recent experimental measurements of DNA size for linear and circular topologies in nanoslits with depths around ≈2p, where p is the DNA persistence length [E. A. Strychalski, J. Geist, M. Gaitan, L. E. Locascio, S. M. Stavis. Macromolecules, 45, 1602-1611 (2012)]. Our empirical approach revealed a localized transition between confinement regimes for circular DNA at a nanoslit depth of ≈3p but detected no such transition for linear DNA with a similar contour length. These results provide the first indication of the localized influence of polymer topology on size variation across changing nanoslit depths. Improved understanding of differences in polymer behavior due to topology in this controversial system is of fundamental importance in polymer science and will inform new nanofluidic methods for biopolymer analysis.

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