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Modification of the coil-stretch transition by confinement PATRICK DOYLE, JING TANG, JEREMY JONES, MIT, MIT TEAM — Large double stranded DNA are both a powerful system to study polymer dynamics at the single molecule level and also important molecules for genomic applications. While homogenous electric fields are routinely used to separate DNA in gels, DNA deformation in more complex fields has been less widely studied. We will demonstrate how micro/nanofluidic devices allow for the generation of electric fields with well-defined kinematics for trapping, stretching and then watching DNA relax back to equilibrium. The dimensions of the devices highly confine DNA and subsequently change both their conformation and dynamics. We will show how these confinements effects change the coil-stretch transition of a DNA being electrophoretically stretched in a purely elongational electrical field. We experimentally show that a two-stage coil stretch transition occurs and develop a simple dumbbell model which captures most of the relevant physics. We trace the origin of this phenomena to the modification of the effective spring law due to confinement.

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