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**Collapse of single polyelectrolytes in a.c. electric fields** CHUNDA ZHOU, ROBERT RIEHN, NC State University — Experimental and theoretical studies of single polyelectrolyte molecules under alternating electric fields have concluded that stretching is the near-universal response. We confined fluorescently stained $\lambda$-DNA (48.5 kbp, $\approx$16 $\mu$m contour length) in TBE buffer solution in 500 nm x 10 $\mu$m microchannels and applied alternating electric fields ranging from 0 kV/cm to about 2 kV/cm. We observed that DNA molecules collapsed under these conditions, in contrast to the literature reports. We observed single molecules with a fluorescence microscope, and analyzed the radius of gyration of each molecule in each frame. The threshold of the electric field at which DNA molecules start to collapse depends on both the concentration of TBE buffer solutions and the frequencies of the alternating electric fields. In particular, the critical electric field for collapse increases as the frequency increases. In our experiment, DNA molecules were suspended in 0.25x TBE, 0.5x TBE, 1x TBE and 2x TBE buffer solution, and the frequency was 100 Hz, 200 Hz, 300 Hz, 450 Hz, 675 Hz or 800 Hz. The critical electric field ranged from 0.5 kV/cm to 1.5 kV/cm. We believe the phenomenon is due to aggregation of density fluctuations within the polymer coil, which is not described in traditional homogeneous coil models.

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