Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Conformation and stretching of end-tethered polymers in pressure-driven flow under confinement.[1] TAMAL ROY, STEFFEN HARDT, Institute for Nano- and Microfludics, Technische Universitt Darmstadt, INSTITUTE FOR NANO- AND MICROFLUDICS, TECHNISCHE UNIVERSITT DARMSTADT TEAM — Understanding of the conformation and dynamics of polymers under confinement is important for both fundamental studies and applications. We experimentally study the conformation and stretching of surface-tethered polymer chains confined between parallel surfaces and exposed to a pressure-driven flow. λ-DNA molecules are tethered to the wall of a microchannel of height smaller than the contour lengths of the molecules. The DNA molecules, stained with a fluorescent dye, are visualized by epifluorescence and laser-scanning confocal microscopy (LSCM). The effects of the channel height, flow rate and contour length on the extension of the molecules are determined from epifluorescence images. From LSCM images the complete conformation and orientation of the DNA molecules is inferred. We find that the fractional extension of the molecules is uniquely determined by the fluid shear stress at the tethering surface and the chain contour length. There is no explicit influence of the channel height in the range of contour lengths we consider. We also derive analytical scaling relationships (in the weak and strong extension limits) that explain the experimentally observed stretching characteristics.

[1]This work is supported by Deutsche Forschungsgemeinschaft (grant No. HA 2696/33-1)

Tamal Roy
Institute for Nano- and Microfludics, Technische Universitt Darmstadt

Date submitted: 27 Jun 2016 Electronic form version 1.4