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Formatting biopolymers using adjustable nanoconfinement DANIEL BERARD, MARJAN SHAYEGAN, FRANCOIS MICHAUD, GIL HENKIN, SHANE SCOTT, SABRINA LESLIE, McGill University — Sensitive visualization and conformational control of long, delicate biopolymers present critical challenges to emerging biotechnologies and biophysical studies. Next-generation nanofluidic manipulation platforms strive to maintain the structural integrity of genomic DNA prior to analysis but can face challenges in device clogging, molecular breakage, and single-label detection. We address these challenges by integrating the Convex Lens-induced Confinement (CLiC) technique with a suite of nanotopographies embedded within thin-glass nanofluidic chambers. We gently load DNA polymers into open-face nanogrooves in linear, concentric circular, and ring array formats and perform imaging with single-fluorophore sensitivity. We use ring-shaped nanogrooves to access and visualize confinement-enhanced self-ligation of long DNA polymers. We use concentric circular nanogrooves to enable hour-long observations of polymers at constant confinement in a geometry which eliminates the confinement gradient which causes drift and can alter molecular conformations and interactions. Taken together, this work opens doors to myriad biophysical studies and biotechnologies which operate on the nanoscale.

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