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Manipulating and Visualizing Molecular Interactions in Customized Nanoscale Spaces FRANCIS STABILE, GIL HENKIN, DANIEL BERARD, MARJAN SHAYEGAN, JASON LEITH, SABRINA LESLIE, McGill University — We present a dynamically adjustable nanofluidic platform for formatting the conformations of and visualizing the interaction kinetics between biomolecules in solution, offering new time resolution and control of the reaction processes. This platform extends convex lens-induced confinement (CLiC), a technique for imaging molecules under confinement, by introducing a system for in situ modification of the chemical environment; this system uses a deep microchannel to diffusively exchange reagents within the nanoscale imaging region, whose height is fixed by a nanopost array. To illustrate, we visualize and manipulate salt-induced, surfactant-induced, and enzyme-induced reactions between small-molecule reagents and DNA molecules, where the conformations of the DNA molecules are formatted by the imposed nanoscale confinement. By using nanofabricated, nonabsorbing, low-background glass walls to confine biomolecules, our nanofluidic platform facilitates quantitative exploration of physiologically and biotechnologically relevant processes at the nanoscale. This device provides new kinetic information about dynamic chemical processes at the single-molecule level, using advancements in the CLiC design including a microchannel-based diffuser and postarray-based dialysis slit.

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