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Pressure-driven single-file transport of DNA molecules along linear arrays of nanopits embedded in a slit-like nanochannel.[1] JACKSON DEL BONIS-O'DONNELL, WALTER REISNER, Brown University, ANDERS KRISTENSEN, Technical University of Denmark, DEREK STEIN, Brown University — Due to the growth in nanobiofluidic technology for DNA manipulation and analysis there is growing interest in understanding the physics of DNA in nanoconfined environments. Using fluorescence video microscopy we study the transport of DNA in slit-like nanochannels with an embedded nanotopology consisting of linear arrays of nanopit structures. The nanopit structures are made via a two level fabrication process: (1) An ebeam lithography and etching step to make the nanopits followed by (2) a photolithography step to fabricate the slit. Under an applied pressure drop the DNA molecules are observed to move single-file down the nanopit array undergoing sequential pit-to-pit hops. We make systematic measurements of pressure dependent nanopit velocity. We observe two distinct transport regimes depending on whether the molecule configuration can occupy a single pit or must subtend multiple pits. We interpret our results in terms of a simple scaling picture of the free energy of chains in the linear array.

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