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Fluidic Switching in Nanochannels for the Control of a Synthetic DNA-based Motor C.S. NIMAN, M. BALAZ, J.O. TEGENFELDT, Nanometer Structure Consortium (nmC@LU) and Division of Solid State Physics, Lund University, Sweden, P.M.G. CURMI, School of Physics, University of New South Wales, Australia ; Centre of Applied Medical Research, Australia, N.R. FORDE, M. ZUCKERMANN, Department of Physics, Simon Fraser University, Canada, HEINER LINKE, nmC@LU and Division of Solid State Physics, Lund University, Sweden — Processive molecular motors are thought to utilize a "power stroke" whereby chemical changes are converted into conformational changes, facilitating forward motion. We have developed a concept for a synthetic molecular motor, the Inchworm (IW), which harnesses salt-induced changes in DNA conformation[1] to achieve power strokes. To implement IW we must switch between four solutions (of varied salt concentration) surrounding DNA confined in a nanochannel (NC) while monitoring its response. We have developed NCs of radii 100-400 nm, with 10-20 nm wide top-slits for buffer exchange via diffusion from adjacent microfluidic channels[2]. NCs are made in SiO_2 to allow for imaging through the substrate. To cycle through four buffers specifically designed microchannels are used[3]. We measure changes in intensity when fluids containing fluorescent molecules are switched, with and without a pressure difference over the NCs. By fitting this data we extract effective diffusivity of molecules and determine fluid velocities, information that is crucial for evaluating IW performance.

[1] W.Reisner et al., PRL 2007, 99, 058302;
[2] M.Graczyk et al., J. Vac. Sci. & Technol. B 2012, 30, 6;
[3] C.S.Niman et al., Lab Chip 2013, 13, 2389

Cassandra S. Niman
Nanometer Structure Consortium (nmC@LU) and
Division of Solid State Physics, Lund University

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