Lateral migration and focusing of colloidal particles and DNA molecules under viscoelastic flow

Electronic Supplementary Information

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List of Supplementary Information

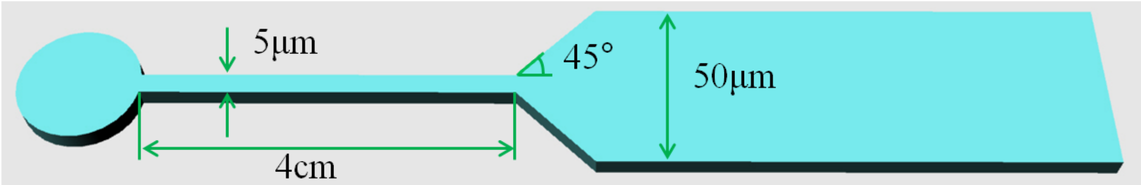
SI Fig. S1. Schematic diagram for the colloidal particle migration experiments. Channel height was constantly 5μm. Images were acquired at the end of the straight channel of 5 μm × 5 μm (height×width).

SI Fig. S2. (a) Schematic diagram for experimental set-ups for the DNA migration (the images were observed with a ×100 oil-immersion objective installed on an inverted microscope (IX71, Olympus) underneath the microchannel). The length of the straight channel was 5 cm. (b) Image processing procedures: (1) acquisition of digital images of fluorescent DNA molecules under flows with a high-sensitive EMCCD (DV897, Andor), (2) stacking up 1000 frames with Image J (NIH), (3) obtaining half maximal width in intensity profile (HMWI) across the channel. In the figures, the yellow-dotted lines denote the locations of channel walls.

SI Fig. S3. Separation of nanoparticles (100nm) from 100nm/500nm particle mixture (0.002 wt%: 0.002wt%) at 10 μl/hr. The 100nm and 500nm particles have different emission wave lengths as 440nm and 605nm, respectively and (a) and (b) were acquired using band-pass filters for each particle size, respectively.

Fig. S4. Stacked images for fluorescent microspheres with 0.5μm and 1.0 μm diameters according to imposed pressure in a rectangular channel with dimension of 30 μm × 10 μm (width × height): (a) 0.5 μm particles in 22wt% 1.5×TBE glycerol solution, (b) 0.5 μm particles in 500 ppm PEO solution in 22wt% 1.5×TBE glycerol solution, (c) 1.0 μm particles in 22wt% 1.5×TBE glycerol solution, (d) 1.0 μm particles in 500 ppm PEO solution in 22 wt% 1.5×TBE glycerol solution.

Fig. S5. Normalize L_d according to the imposed pressures and the distances from the inlets for T4-DNA molecules in a Newtonian (a) and a viscoelastic (b) media, respectively. 1 psig: Wi=0.18, Re=1.5$\times$10^{-3}; 2 psig: Wi=0.39, Re=3.2$\times$10^{-3} ; 3 psig: Wi=0.62, Re=5.0$\times$10^{-3}; 4 psig: Wi=0.84, Re=6.8$\times$10^{-3}; 5 psig: Wi=1.1, Re=8.6$\times$10^{-3}; 6 psig: Wi=1.3, Re=1.1$\times$10^{-2}; 7 psig: Wi=1.6, Re=1.3$\times$10^{-2}; 8 psig: Wi=1.8, Re=1.5$\times$10^{-2} and El = 120 for viscoelastic fluid. 1 psig: Re=3.6$\times$10^{-3}; 2 psig: Re=8.0$\times$10^{-2}; 3 psig: Re=1.7$\times$10^{-2}; 4 psig: Re=2.2$\times$10^{-3}; 5 psig: Re=2.7$\times$10^{-2}; 6 psig: Re=2.7$\times$10^{-2}; 7 psig: Re=3.2$\times$10^{-2}; 8 psig: Re=3.7$\times$10^{-3}, and Wi and El = 0 for Newtonian fluid.



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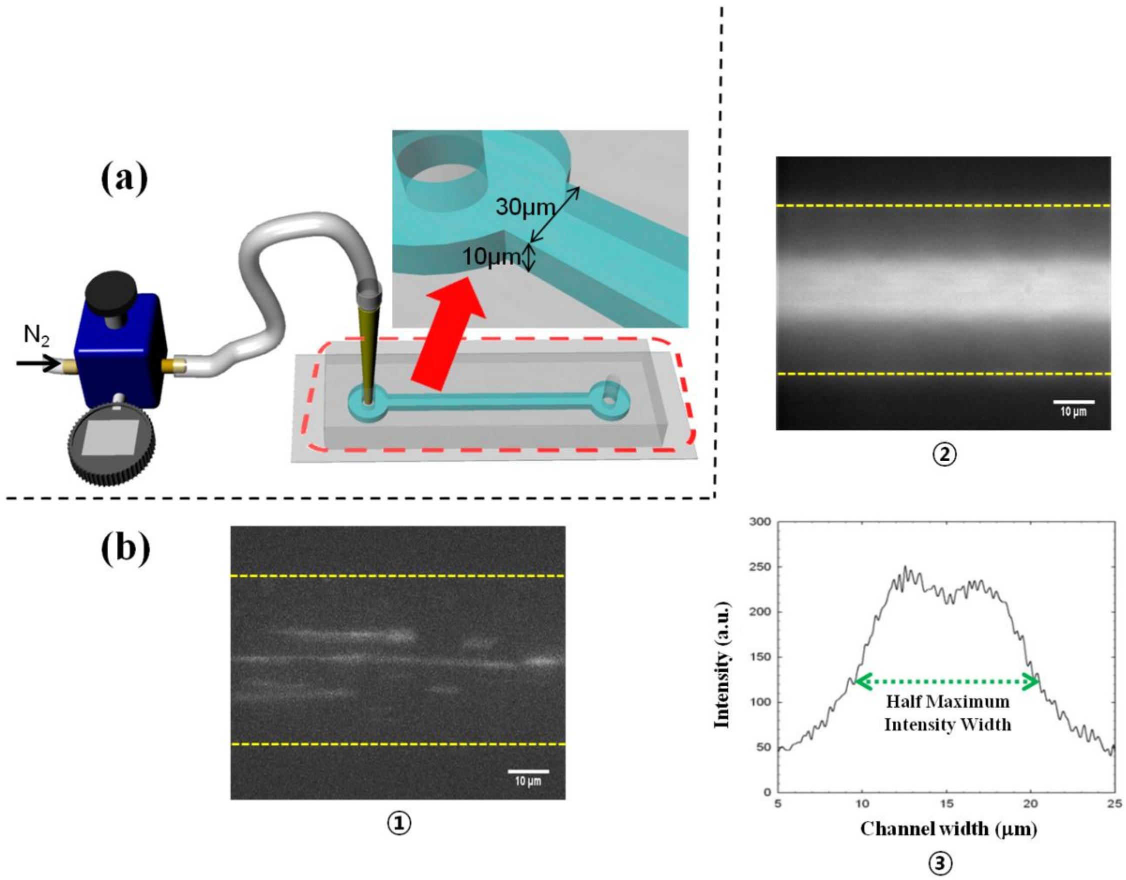
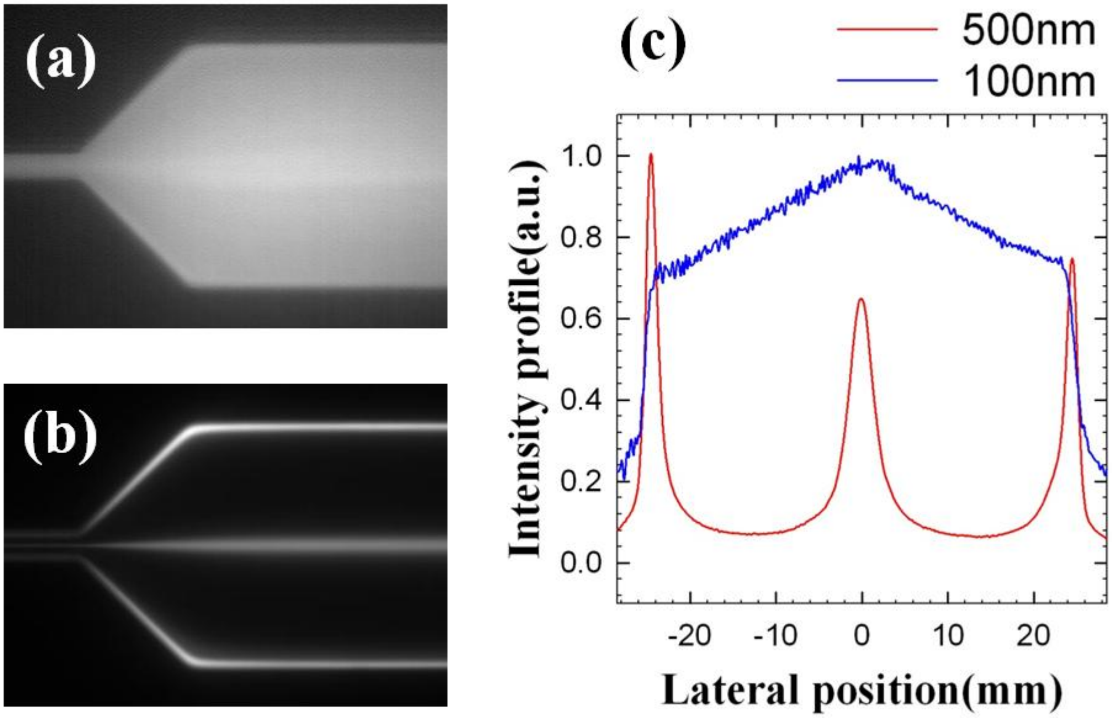


Fig. S2. (a) Schematic diagram for experimental set-ups for the DNA migration (the images were observed with a ×100 oil-immersion objective installed on an inverted microscope (IX71, Olympus) underneath the microchannel). The length of the straight channel was 5 cm. (b) Image processing procedures: (1) acquisition of digital images of fluorescent DNA molecules under flows with a high-sensitive EMCCD (DV897, Andor), (2) stacking up 1000 frames with Image J (NIH), (3) obtaining half maximal width in intensity profile (HMWI) across the channel. In the figures, the yellow-dotted lines denote the locations of channel walls.



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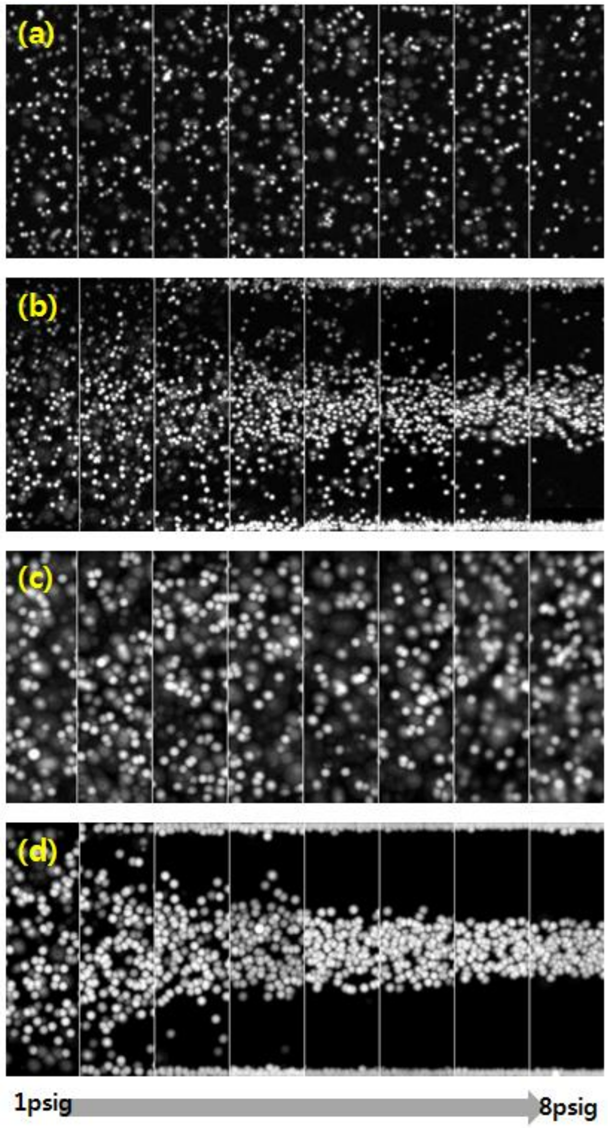

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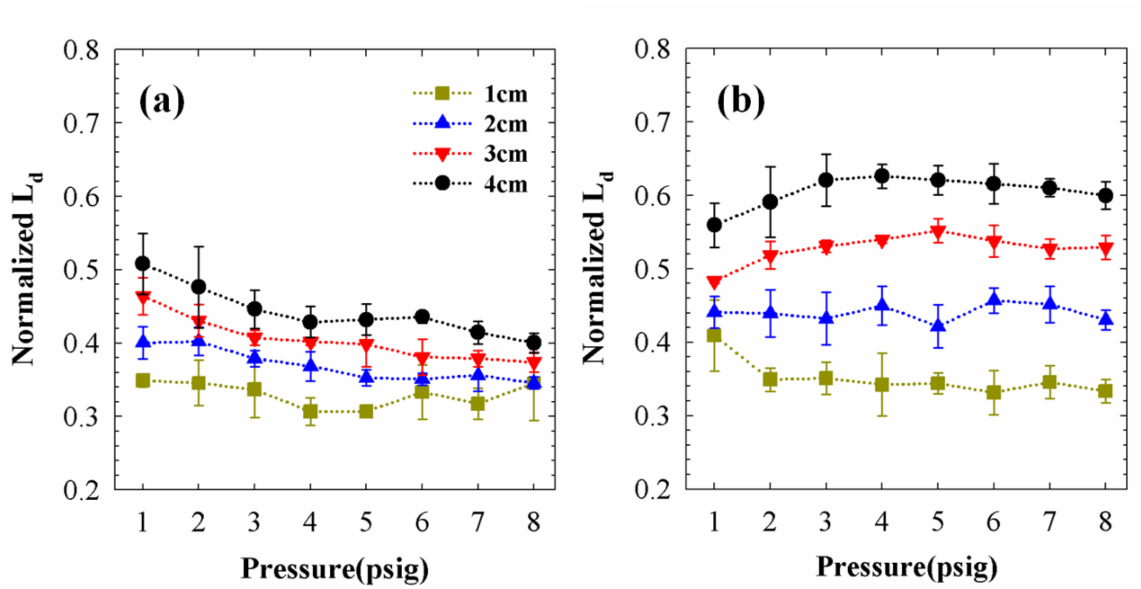

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