# Supporting Material

## DNA Chip (Immobilization of MFPs on Slides , bottom surface)

DNA oligomers **1**, **2**, and **3** were purchased HPLC grade from IBA GmbH (Goettingen, Germany). Sequences and modifications of all oligonucleotides are the following: shear geometry: $\mathbf{1_S}$, $NH_2$-$(HEGL)_5$-5′-$(T)_{10}$-CTG CAG GAA TTC GAT ATC AAG CTT ATC GAT-3′; $\mathbf{2_S}$, 3′-GAC GTC CTT AAG CTA TAG TTC GAA TAG CTA C-$(T)_7$-5′-5′-T(Cy5)-$(T)_7$-C GAC GTC CTT AAG CTA TAG TTC GAA TAG CTA-3′; $\mathbf{3_S}$, biotin-5′-$(T)_{10}$-TAG CTA TTC GAA CTA TAG CTT AAG GAC GTC(Cy3)-3′. Zipper geometry: $\mathbf{1_Z}$, 5′-CTG CAG GAA TTC GAT ATC AAG CTT ATC GAT-$(T)_{10}$-$(HEGL)_5$-$NH_2$-3′; $\mathbf{2_Z}$, 5′-GAC GTC CTT AAG CTA TAG TTC GAA TAG CTA C-$(T)_7$-T(Cy5)-$(T)_8$-C ATC GAT AAG CTT GAT ATC GAA TTC CTG CAG-3′; $\mathbf{3_Z}$, biotin-5′-$(T)_{10}$-TAG CTA TTC GAA CTA TAG CTT AAG GAC GTC(Cy3)-3′. The five hexaethyleneglycol (HEGL) linkers are connected via phosphate groups. DNA oligomer **1** is amine-modified, which allows covalent linkage to aldehyde-functionalized glass slides (Schott GmbH, Jena, Germany). We spotted 1 μL drops of 5× SSC (saline sodium citrate; Sigma-Aldrich GmbH, Munich, Germany) containing 25 μM oligomer **1** on the aldehyde slide in a 4 × 4 pattern and incubated the slide in a saturated NaCl $ddH_2O$ atmosphere overnight. After washing the slide with $ddH_2O$ containing 0.2% sodium dodecyl sulfate (SDS; VWR Scientific GmbH, Darmstadt, Germany) and thoroughly rinsing the slide with $ddH_2O$ we reduced the resulting Schiff bases with 1% aqueous $NaBH_4$ (VWR Scientific GmbH, Darmstadt, Germany) for 90 min. Subsequently, the slide was washed with 1× SSC and thoroughly rinsed with $ddH_2O$. In order to reduce nonspecific binding, the slides were blocked in 1× SSC containing 4% bovine serum albumin (BSA; Sigma-Aldrich GmbH, Munich, Germany) for 20 min. Custom-made 16-well silicone isolators (Grace-Biolabs, OR) were placed on top of the immobilized DNA oligomer **1**. The 100 nM Cy5-modified oligomer **2** and 200 nM biotin-modified oligomer **3** were hybridized to the latter for 30 min, completing the **1** · **2** · **3** complex on the glass slide. After removing the silicone isolators the slides were washed with a self-made fluidic system driven by a multi-channel peristaltic pump (Ismatec GmbH, Wertheim-Mondfeld, Germany) to remove any unspecific bound DNA oligomers. The 4 × 4 pattern was rinsed subsequently with 2× SSC, 0.2× SSC containing 0.1% Tween 20 (VWR Scientific GmbH, Darmstadt, Germany) and 1× PBS each with 50 ml in 5 min.

**PDMS stamp (Top Surface)**

The stamp is made of polydimethylsiloxane (PDMS) and is fabricated as detailed previously with some modifications.[1] PDMS stamps are fabricated by casting 10:1 (base/crosslinker) (Sylgard, Dow Corning, MI) into a custom-made micro- and millistructured silicon wafer (HSG-IMIT, Villingen-Schwenningen, Germany).[2] After curing was complete, the PDMS was taken out of the mold and cut into a 4 × 4 pillar arrangement. Each pillar is 1 mm diameter, is 1 mm high, and carries a microstructure on the flat surface: 100 mm × 100 mm pads are separated by 41 mm wide and 5 mm deep trenches allowing for liquid drainage during the contact and separation process. Free polymers were extracted in toluene for at least one day.[3] The PDMS was activated overnight in 12.5% hydrochloric acid and subsequently derivatized with (3-glycidoxypropyl)-trimethoxysilane (ABCR, Karlsruhe, Germany) to generate epoxide groups. $NH_2$-PEG-Biotin (3400 g/mol; Rapp Polymere, Tuebingen, Germany) was melted at 80°C, and ~1 mL was spotted on each pillar followed by overnight incubation in argon atmosphere at 80°C. The excess polymers were thoroughly removed with dd$H_2O$. Shortly before the experiment, the PDMS was incubated with 1 mg/mL streptavidin (Thermo Fisher Scientific, Bonn, Germany) in 1× PBS and 0.4% bovine serum albumin for 60 min, washed with 1× PBS containing 0.1% Tween 20, with 1× PBS and gently dried with $N_2$ gas.

## References


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3. S. Perutz, E. Kramer, J. Baney and C. Hui, *Macromolecules*, 1997, **30**, 7964-7969.