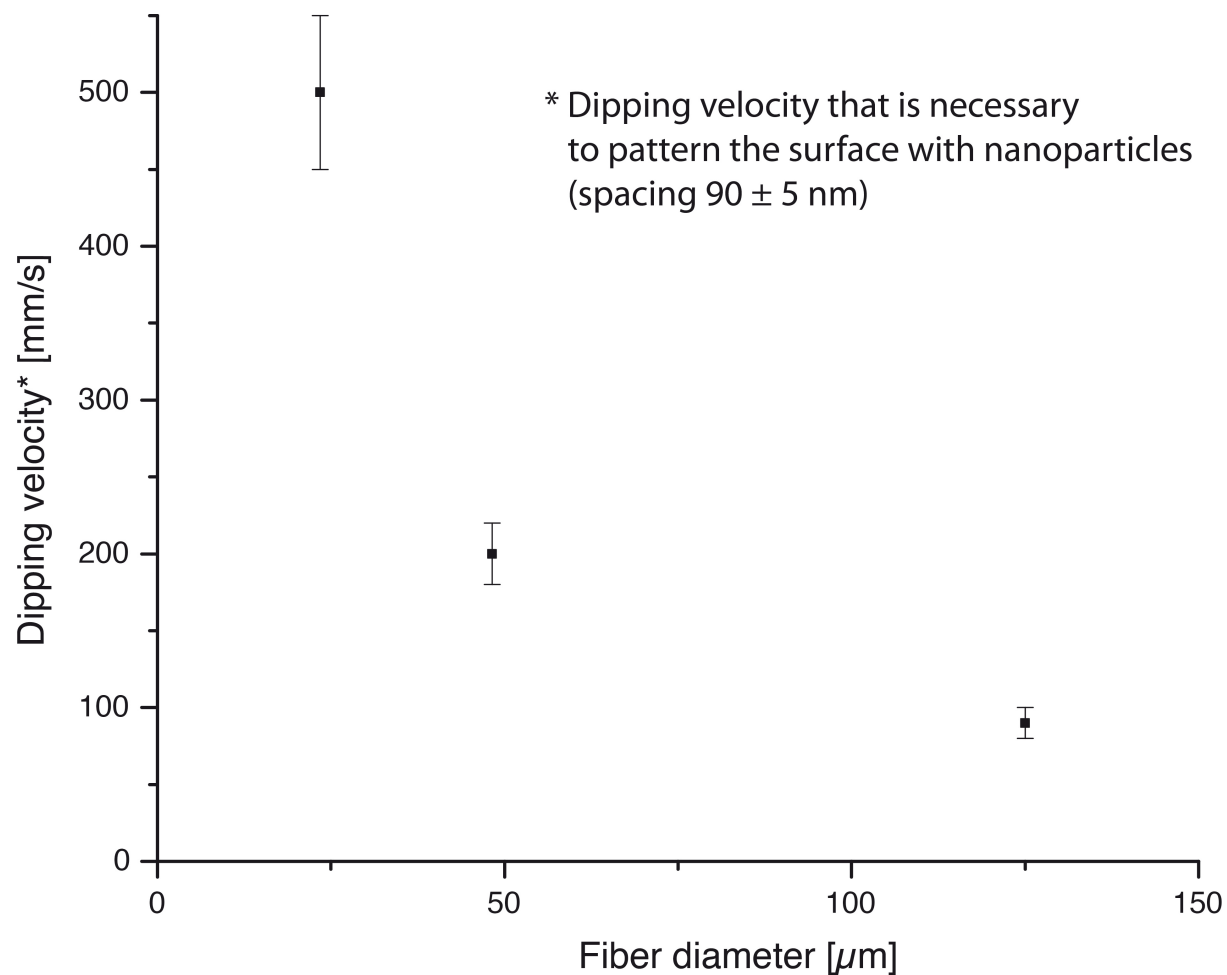


Electronic Supplementary Information (ESI)

Supplementary Figure 1:



S 1: The dipping speed that is necessary to fabricate 90 nm spacings depends on the fiber diameter.

Materials and Methods

Glass fiber etching

Glass fibers (125 μm diameter, AFS50, Thorlabs, Europe) were cut into 10 cm long pieces. The fiber coating was removed by ultrasonication in acetone (p.A., Merck KGaA, Germany). The fibers were ultrasonicated an additional two times in acetone and water for 5 min to remove coating residues. The fibers were then mounted onto a sample holder (5 fibers in parallel) to ease handling. Etching was performed by dipping the fibers into hydrofluoric acid (40 %, p.A., Merck KGaA). Fiber diameters after different etching periods were evaluated by scanning electron microscopy (Zeiss Ultra 55) at 5 different positions on three independent samples. After etching, the fibers were dipped into water to remove hydrofluoric acid residues and were dried with nitrogen.

Block copolymer micelle lithography (BCML) on glass fibers

BCML on planar substrates has been described recently¹. We adapted the method to curved substrates. For dip coating we used a linear motor (Faulhaber LM 1247, Germany) equipped with a holder for fibers. Dipping velocities ranged from 10 mm/s – 800 mm/s. We used only those parts of the fibers that were dip coated at a constant speed. Micellar solutions were prepared by dissolving the polystyrene polyvinylpyridine- blockcopolymers PS(25000)-b-P2VP(15000), PS(52200)-b - P2VP(34000) and PS(110000)-b-P2VP(52000) (Polymersource, USA) in toluene at concentrations of 5 mg/ml (p.A., Merck KGaA). The micelles were loaded with $\text{HAuCl}_4 \cdot 3\text{H}_2\text{O}$ (Sigma, Germany) at a molar ratio of 0.4. Finally, the organic components of the micelles were removed by 45 min hydrogen plasma treatment (TePla PS100 microwave plasma system, Germany, 150 W, 0.4 mbar).

Transferlithography and flow chamber setup

Nanostructured hydrogel channels were obtained by polymerizing the hydrogel around the nanostructured fiber, incorporating the nanoparticles in the hydrogel and subsequent removal of the glass fiber. The first two steps are described for planar glass surfaces and other polymers elsewhere^{2,3}. To obtain a cylindrical channel within a hydrogel cuboid we used an outer cuboid mold (20 x 20 x 4mm), inside which the hydrogel could polymerize around the fiber. The glass fiber ends were fixed into two tubes (Tygon S-54-HL, $d=0.254$ mm, Kleinfeld Labortechnik, Germany) using UV glue (Bohle, Typ 665-0, Germany). These tubes (hitherto referred to as primary tubes) were placed centrally at the ends of the cuboid mold, thus serving as a holder for the stretched fiber and creating a cavity into which inlet and outlet tubing could later be inserted. The stretched nanostructured glass fibers were incubated for 1 h in 1 mM N,N'-bisacryloylcystamine (Fluka, Germany) in ethanol.

After washing and drying the fibers, a 1:0.95:0.05 (mass ratios) mixture of polyethylene glycol (PEG)-diacrylate (700 g/mol, Sigma-Aldrich, Germany), water and a saturated solution of 2-hydroxy-4'-(2-hydroxyethoxy)-2-methylpropiophenone (Sigma-Aldrich) was poured into the cuboid mold and polymerized by UV-B light (365 nm) around the fiber. Afterwards, the hydrogels were left to swell (<5%) for 2 h in water, which made them detach from the mold. The glass fiber was removed from the hydrogel by etching with 20 % hydrofluoric acid over night, followed by 4 washing steps in water (each 1 h). The primary tubes were removed and the final inlet and outlet tubing was attached inside the preformed cavities using UV glue (Bohle, Typ 665-0, Germany). The inlet and outlet tubes were attached to an AL-100 syringe pump (World Precision Instruments) and an Eppendorf tube, respectively.

Biofunctionalization and cell experiments

To biofunctionalize the Au-NPs, we first incubated the channel for 90 min with 50 $\mu\text{g}/\text{ml}$ Protein A (Sigma, Germany) in PBS (Invitrogen, Germany). The channel was then flushed with PBS and incubated for 2 h with 10 $\mu\text{g}/\text{ml}$ recombinant human P-selectin-IgG (R&D, Germany). After an additional PBS flushing step the channels were used for cell experiments. Cell experiments and cell culture were performed in RPMI medium (Gibco, Germany) supplemented with 20% fetal calf serum (Invitrogen, Germany). KG1a cells (DSMZ, Germany) were used from passage 5 to 30. Cells were cultured at $5 \times 10^5/\text{ml}$ - $2.5 \times 10^6/\text{ml}$. Fluorescent labeling of the cells was performed using the CellTrace CFSE Cell Proliferation Kit (Invitrogen, Germany) according to the supplier's instructions. A Zeiss Axiovert 200 System equipped with a Phantom V7.2 (VisionResearch, USA) camera was used for light microscopy (10 frames/s). We tracked the cells with the ImageJ (1.45s, NIH, USA) Manual Tracking Plugin.

References

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