# Electronic Supplementary Information

# **One-Step Synthesis of Patterned Polymer Brushes by Photocatalytic Microcontact Printing**

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## I. General Information

A Leica DMRE with a TCS SL scanning unit (Leica Microsystems Heidelberg GmbH, Mannheim, Germany) was used for light microscopy. Surface UV-irradiation was performed with four *P8D2 High Power 364 nm* UV LEDs ( $\lambda = 365$  nm, *Seoul Optodevice*, Ansan, Gyeonggido, Korea). Dynamic light scattering (DLS) measurements were carried out on a *Nano ZS Zetasizer (Malvern Instruments Ltd.*, Worcestershire, UK) in disposable *semi-micro PMMA* cuvettes (*BRAND GmbH & Co. KG*, Wertheim, Germany) with a path length of 1 cm. AFM measurements were performed using a *Nano Wizard (JPK Instruments AG)* in tapping mode under air on silicon surfaces. XPS spectra were measured on an *Axis Ultra (Kratos)*. Analysis of the AFM data was done with the software *Casa XPS* (Version 2.3.15). All chemicals were purchased from *Acros Organics, Fischer Scientific GmbH*, Schwerte, Germany *Aldrich, Sigma-Aldrich Chemie GmbH*, Taufkirchen, Germany and *Alfa Aesar, Alfa Aesar GmbH & Co KG*, Karlsruhe, Germany and used without further purification.

# **II.** Sample Preparation

## I.I. Preparation of PDMS stamps

PDMS stamps were prepared from Sylgard 184, Dow Corning by mixing poly(dimethylsiloxane) and curing agent 10:1, pouring this mixture on a patterned silicon master and curing the combination at 60 °C over night. The stamps were removed from the silicon master, cut out with a scalpel and oxidized with a UV ozonizer (PSD-UV,Novascan Technologies Inc.) for 55 min before to use. If not used immediately, the PDMS stamps were stored in distilled water.



Figure 1: left: PDMS plate removed from silicon master, right: single PDMS stamp

### I.II. Preparation of 11-(trichlorosilyl)undecan-1-ol SAMs

Glass or silicon slides were cut into pieces of around 1.4x1.0 cm, sonicated in pentane, EtOH<sub>abs.</sub> and milliQ water for 5 min each and dried in a stream of argon. Afterwards they were immersed in a freshly prepared solution of piranha (H<sub>2</sub>SO<sub>4</sub>/H<sub>2</sub>O<sub>2</sub> 3:1) for 30 min, washed extensively with H<sub>2</sub>O<sub>dest.</sub>, dried and put in a fresh solution of 11-(trichlorosilyl)undecyl acetate for 1 h. Subsequently the surfaces were sonicated in EtOH<sub>abs.</sub> for 5 min, dried and given in a 2.5 M solution of HCl and stirred for 2 h at 85 °C to deprotect the alcohol function. Directly prior to use the surfaces were cooled to room temperature, washed with milliQ water and dried in a stream of argon.

#### I.III. Preparation of TiO<sub>2</sub> nanoparticles

A 100 mL three neck flask was filled with 60 mL of diethyleneglycol under argon atmosphere was heated under stirring to 60 °C. 2 mL of TiCl<sub>4</sub> were added by pipette and the temperature raised to 75 °C. After addition of 1 mL of H<sub>2</sub>O the mixture was stirred for 3 h at 160 °C. After cooling to room temperature the stirring was stopped and the flask was allowed to stand overnight. The suspension was transferred to a beaker, 100 mL of acetone were added and the whole mixture centrifuged at 3500 turns/min for 10 min. The white precipitate was washed at least three times with acetone and the remaining solvent was removed under vacuum. DLS measurements showed a diameter of 4-5 nm.

#### I.IV. Preparation of cellulose surfaces

2.5 g of cellulose were mixed in a 250 mL round bottom flask with 100 mL of dimethylacetamide. The mixture was stirred at 130 °C for 2 h. After cooling of the slurry to 100 °C 5 g of LiCl were added and the stirring continued over night and the cellulose dissolved completely.

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 $150 \ \mu$ L of cellulose solution were dropped on the surface and spin coated at 7500 turns/min for 150 s. The surfaces were subsequently carefully washed with a mixture of isopropanol/ H<sub>2</sub>O 6:4 to remove LiCl and dried over night in an oven at 120 °C.

## **III.** Microcontact Printing

A freshly oxidized PDMS stamp was covered with  $30 \,\mu\text{L}$  of fresh ink solution (5 mg TiO<sub>2</sub> nanoparticles in 1 mL of MeOH were sonicated for 10 min,  $3 \,\mu\text{L}$  of ethanolamine were added and sonicated again for 1 min) and incubated for 1 min. The stamp was dried in a stream of argon, placed carefully on a freshly prepared 11-(trichlorosilyl)undecan-1-ol SAM surface and irradiated with a 365 nm high power UV LED, which was placed around 2 cm above the stamp, for 30 min. After removing of the stamp, the surface was sonicated in DCM, EtOH<sub>abs.</sub> and milliQ water to remove all molecules, which are not covalently bond to the surface. After sonication the surface was dried in a stream of argon and left under vacuum overnight.

## **IV.** Additional Experiments

Immobilization of anionic SNPs on polymer brushes

A few drops of a 1 mg/mL solution of SNPs in EtOH were added to a dry patterned polymer brush surface and left till the EtOH was evaporated. To reach the half-filled polymer brushes, the surface was tilted by a few degrees during evaporation.



## V. Additional Analysis

Figure S1: AFM measurements after different irradiation times and correlation of irradiation time to average profile height (different feature width due to the use of different patterned stamps).



Figure S2: Profilometry measurements of cellulose coated surface.



Figure S3: XPS analysis of PEI on cellulose coated surfaces.