

Supplementary Information

Experimental:

Gold films (100nm) were coated on freshly cleaved mica surfaces using (Edwards FL 400) at rate of 0.2 nm/s and under a pressure of 5×10^{-6} mbar. Film thickness was monitored by a quartz crystal oscillator. After evaporation, the mica supported gold films were placed on a stainless steel plate which was kept inside a glass tube of a tube furnace. The gold films were annealed at 650°C under a constant flow of N₂ for 2 minutes. Gold (111) coated glass substrates were placed in an ethanolic solution of cystamine alkanethiol (3 mmol) for a period of 12 hours. After self assembly, the surfaces were washed with ethanol to remove unbound cysteamine alkanethiol. Cysteamine coated gold slides were exposed to polymer solution in ethanol (1mg/ml) followed by the solution of NTA amine. The quality of monolayer surface plasmon spectroscopy (SPS). To immobilise the protein, Ni^{II} was bound to NTA group, the gold slides functionalised with NTA were treated with 1 mmol NaOH for 10 minutes, followed by dipping of slides in a solution of NiSO₄ (40 mmol) for 1 hour. Then slides were taken out, washed with (150 mmol) solution of NaCl and deionised water and dried in a stream of N₂. Then silicatein solution (30 nmol) in 3-(N-morpholino) propane sulfonic acid (MOPS) buffer was introduced to the Ni^{II} bound surfaces for 1 hour. Then slides were washed with MOPS buffer and deionised water to get rid of unbound protein and dried by N₂. The immobilisation of silicatein was monitored by CLSM and SPS. The synthesis of titania and zirconia from titanium bis(ammonium lactato) dihydroxide and anion of zirconium fluoride was carried out at room temperature and neutral pH. The silicatein immobilised substrates were placed facing down into a reaction vessel containing 200 ml of titanium bis(ammonium lactato) dihydroxide (4.5 mmol, 135 ml) or potassium hexafluoro zirconate (3 mmol, 135 ml) and MOPS buffer (75 ml). The reaction vessel was transferred into a desiccator. The polymerisation was stopped after 16 hrs. Then substrates were washed with MOPS and deionised water and dried by stream of N₂.

For SPS and (scanning electron microscopy (SEM) glass slides (3.5 x 2.5 cm) were used. Glass slides were cleaned with aq.NH₃ / H₂O₂ / H₂O (1:1:5) for 10 minutes at 80 °C, washed with water and isopropanol and dried in stream of N₂. These glass slides were coated with gold using (Edwards FL 400), vacuum coating unit under pressure of less than 5×10^{-6} hPa, typically depositing 50 nm of gold after first depositing 2 nm of Cr.

Scanning Force Microscopy

Gold (111) surfaces were imaged at room temperature with a commercial SFM (Nanoscope IIIa, Digital Instruments, Santa Barbara, California) employing Tapping Mode TM using rectangular silicon cantilevers (Nanosensors, 125µm long, 30µm wide, 4µm thick) with an integrated tip, a nominal spring constant of 42 N m⁻¹, and a resonance frequency of 330 kHz. To control and enhance the range of the attractive interaction regime the instrument was equipped with a special active

feedback circuit, called Q-control (Nanoanalytics, Germany) as described in *ref. 1*. The quality factor Q of this oscillating system is increased up to one order of magnitude. As a consequence, the sensitivity and lateral resolution are enhanced, allowing us to prevent the onset of intermittent repulsive contact and thereby to operate the SFM constantly in the attractive interaction regime.

SPS Experimental

SPS measurements were performed in the Kretschmann configuration against ethanol. Optical coupling was achieved with a LASFN 9 prism, $n = 1.85$ at $\lambda = 632.8$ nm and index matching fluid $n = 1.70$ between prism and the BK270 glass slides. The plasmon was excited with P-polarized radiation using a He/Ne laser (632.6 nm, 5 mW).

Scanning Electron Microscopy

The SE micrographs were acquired with LEO 1530 by LEO Electron Microscopy Ltd, Cambridge, England Carl Zeiss and Leica Join Forces in Electron Microscopy.

Confocal Laser Scanning microscopy

Fluorescence images were taken by an inverted laser scanning microscope (Leica TCS SL, Leica Microsystems, Bensheim, Germany). A 40x (NA 1.25) oil immersion objective was used for the imaging of all samples.

Synthesis of the reactive ester polymer

The polymer was synthesised according to method already published by Marc et al. A brief description of the synthesis is provided below.

Synthesis of monomer acetoxime methacrylate:

2,19 g (0,03 mol) acetoxime and a few percent of 2,6-di-tert-butyl-4-methyl phenol were dissolved in 60 ml of dry chloroform. To the cold mixture 4,2 ml of triethylamine and 2,9 ml (0,03 mol) methacryloylchloride were added drop wise. The solution was stirred for 3 hours at room temperature. After evaporating the solvent under reduced pressure the salt was filtered off and product was distilled under reduced pressure yielding pure acetoxime methacrylate. ($1,6 \times 10^{-2}$ mbar, bp. 41°C). ¹HNMR: δ [ppm]= 5.99, 5.47, 1.91, 1.88, 1.84.

Polymerisation:

The monomer and 0.01 mol% of AIBN were dissolved in dry dioxane, degassed and stirred for 24 hours at 80°C. The resulting homopolymers were precipitated in cold diethylether.

