Supporting Information

A Novel Approach for Measuring the Intrinsic Nanoscale Thickness of Polymer Brushes by means of Atomic Force Microscopy: Application of a Compressible Fluid Model

José Luis Cuellar[a], Irantzu Llarena[b], Jagoba J. Iturri[b], Edwin Donath[a] and Sergio Enrique Moya[b, c*]

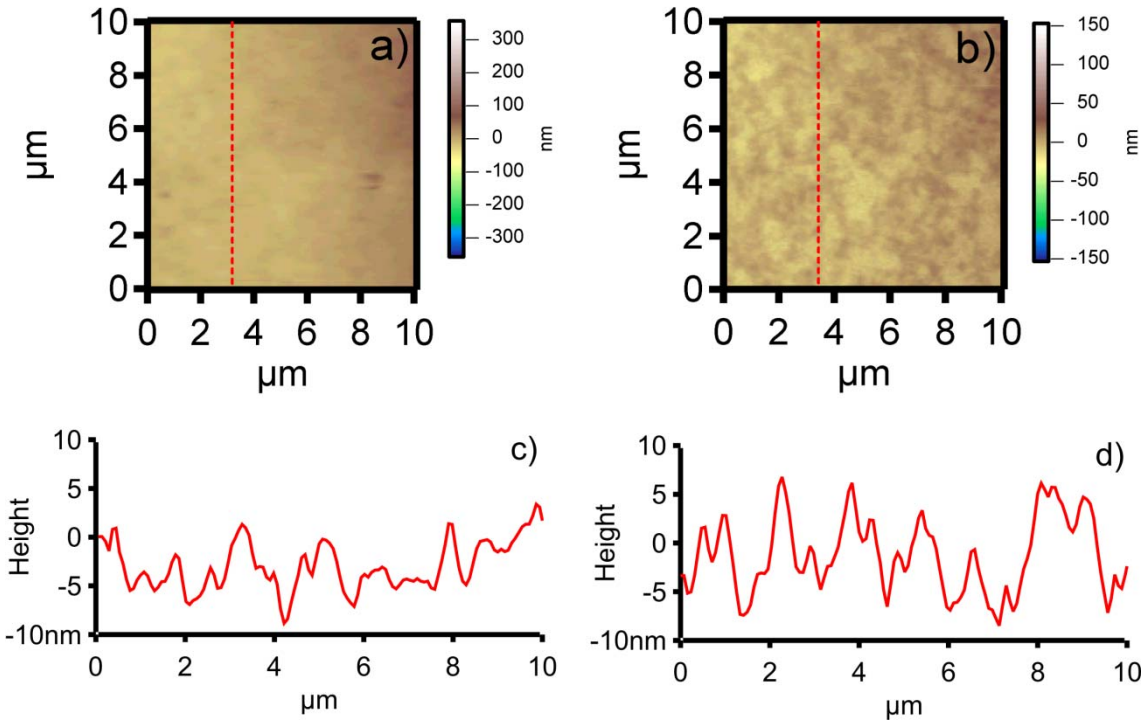

Fig. 1S Topography of a PSPM brush. a) Millipore water. b) Same region measured in 1 M NaCl. c) Section profile in Millipore water. d) Section profile in 1M NaCl. Cross section profiles were taken along the middle section of both scanned regions

The dependence of the brush thickness on loading forces and ionic strength was studied in a systematic fashion. Figure 1S a) and c), respectively, show the topography and the profile of an area homogeneously covered with the brush in Millipore water. The high grafting density together with the brush softness and flexibility, does not allow discerning structural details on the surface. Figures 1S b) and 1S d) show the topography and the profile for the same region after exposure to 1 M NaCl solution. It can be seen that the surface shows a more structured and corrugated appearance.

The variations in height from the average value within the brush monolayer were 6.7 nm in Millipore water and 4.5 nm in 1 M NaCl. The morphology of the brush surface for the intermediate values of 0.01 and 0.1M NaCl did not change considerably compared with Millipore water (not shown). The roughness of the surface was gradually reduced when the brush was imaged with increasing salt concentrations. The surface roughnesses were 30.8, 21.5, 17.8, and 14.0 nm when the brush was imaged in Millipore water, 0.01, 0.1 and 1M NaCl, respectively.

The roughness of the brush surface was obtained with the software IGOR Pro which calculates the root mean square deviation of the surface through

$$R_s = \sqrt{\frac{1}{MN}\sum_{j}^{M}\sum_{i}^{N}\eta^2(x_i y_j)^2}$$

Here M is the number of points per scan line, N is the number of taken profiles within a single area, and η is the

amplitude at a particular x-y-position. When imaged in dry state, the brush surface roughness was 5.2 nm.

Notes and references

[a] *Institute of Biohysics and Medical Physics, Faculty of Medicine, University of Leipzig, Leipzig, Germany E-mail: edwin.donath@medizin.uni-leipzig.de*
[b] *CIC biomaGUNE, Paseo Miramón 182 C, 20009 San Sebastian, Spain E-mail: smoya@cicbiomagune.es*
[c] *Department of Polymer Science and Engineering, Zhejiang University, Hangzhou 310027, China. E-mail: smoya@cicbiomagune.es*