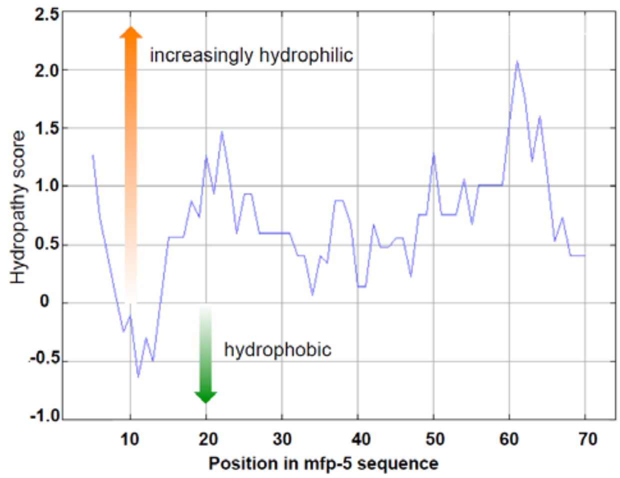
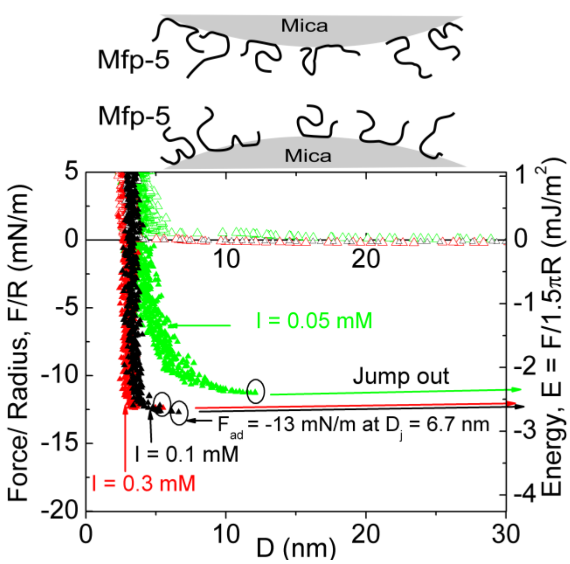
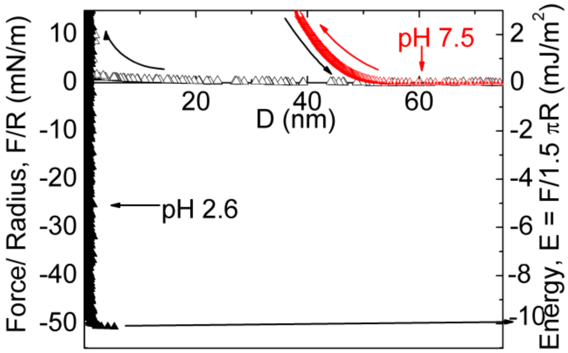
Supporting Figures:



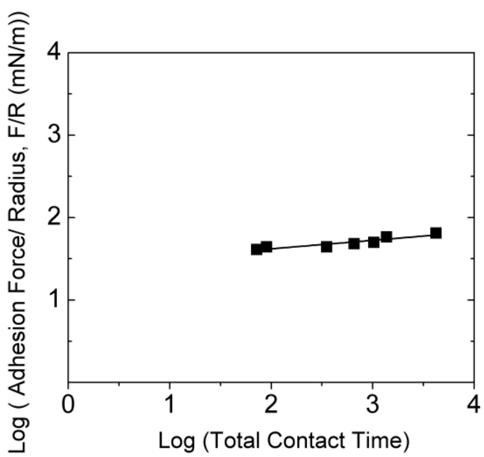
Supplementary Figure S1 - Hopp and Woods hydropathy (ExPaSy tools) plot of Mfp-5 using hydropathy values from (Nozaki and Tanford) for standard amino acids and Dopa. Phospho-serine hydropathy was assumed to resemble values for aspartate.



Supplementary Figure S2- Effect of salt concentration on the Mfp-5/Mfp-5 self-interaction (i.e. cohesion) after a 14 min (840 s) wait time. Deposition of Mfp-5 of symmetric mica sheets at pH 2.6 and I=100mM. Circled portions indicate peak adhesive strengths F_{ad} of the run.



Supplementary Figure S3- Mefp-5 adhesion to mica showing adhesion abolition upon raising the pH to 7.5. I=100mM and I=584 for pH 2.6 and pH 7.5, respectively.



Supplementary Figure S4- Mefp-5 adhesion to mica as plotted on a Log/Log plot with the total contact time against the adhesive force. Linear regression slope= 0.103, R^2=0.82.

Supplementary data - Calculation of the refractive index and volume fraction of compressed protein:

Calculation of the volume fraction of protein in the compressed layer between two mica surfaces in SFA is possible if the refractive index μ can be determined:

$$\mu = \mu_{mica}\sqrt{\frac{(n-1)F_{n-1}}{nF_n} * \frac{\lambda_{n-1}^D - \lambda_{n-1}^0}{\lambda_n^D - \lambda_n^0}}$$ (for odd n) (equation A4 from reference 18)

where μ_{mica} is the refractive index, λ is the wavelength, n is fringe order and F_n is a correction factor approximated by F_n = 1.024 + 1/n. Calculations of 16 runs from three different set-ups gave a refractive index of 1.538 ± 0.012. Using the knowledge that refractive index of water (μ_w) and pure protein (μ_p) have assumed values of 1.333 and 1.55 respectivly, the simple formula

$$volume\ fraction\ = \frac{\mu - \mu_w}{\mu_p - \mu_w}$$

This gives the 95% Mefp-5 ± 5% by volume in the compressed layer.

Supplementary data - Calculations for protein deposition and H-bond strength:

We can use the average $\frac{1}{4}cm^{2}$ piece of mica with a protein deposition 5 nm thick (a common measure for a hard wall). The 5nm of protein is estimated to be 95% (± 5%) protein by volume from the measured refractive index of compressed layers. This approximates the volume of protein to be $2.96 * 10^{-8}\ cm^{3}$. A small protein such as Mefp-5 can be estimated to have a density of 1.45 g/cm^{3} (Quillin et al.). This gives a film of $4.29 * 10^{-8}\ g$ of protein. A deposition of 20 µl of 20 µg/ml has $4 * 10^{-7}$ g of protein which gives a final deposition onto mica of ~11% the possible protein from bulk under these specified conditions.

In the adhesion measurements where the hard wall was 1 nm we can reasonably assume that we have 1/5 of the protein present at 5 nm. This gives us a deposition of $8.58 * 10^{-9}\ \frac{g}{\frac{1}{4}cm^{2} mica}$ and with a M_w of 9.5 kDa and assuming of the 20 mol of Dopa in Mefp-5, half (10) go to each of the two mica sheets, we average $3.61 * 10^{-7}\ \frac{mol\ Dopa}{m^{2}}$. If we take our strongest adhesion value of $0.0137 \frac{J}{m^{2}}$ we find that Dopa can be assigned 40.67 $\frac{kJ}{mol}$. As each Dopa has 2 H-bonds to the mica substrate, a value of 20.34 $\frac{kJ}{mol}$ seems quite reasonable and backs our assumptions as reasonable.

<u>Supplemental Bibliography</u>

Nozaki, Y., and Tanford, C. (1971) The solubility of amino acids and two glycine peptides in aqueous ethanol and dioxane solutions, *J. Bio. Chem. 246*, 2211–2217.

Quillin, M.L., and Matthews, B.W. (2000). Accurate calculation of the density of proteins. *Acta Crystallog. D Crystallography D 56***,** 791-794.