Electronic Supplementary Information (ESI)

Effects of charge and hydrophilicity on the anti-fouling properties of kidney-inspired, polyester membranes

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AFM tip functionalisation with lysozyme schematic

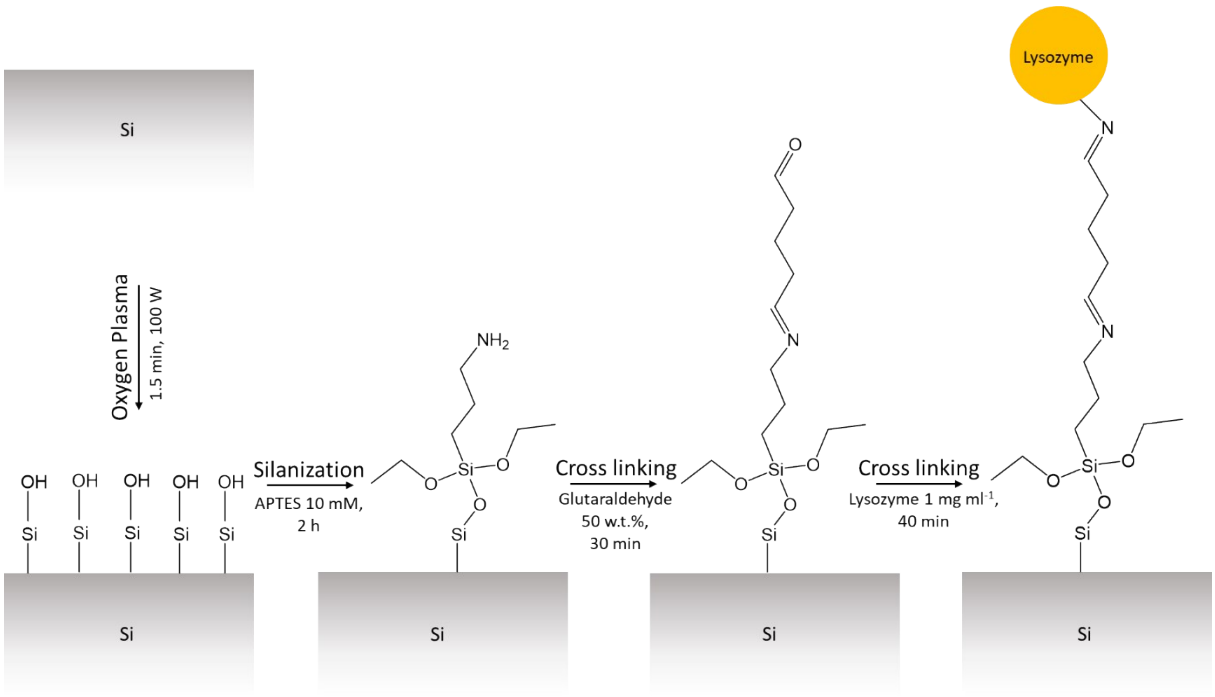

Figure S1: Schematic of AFM tip modification process.

XPS spectra of silicon terminated with glutaraldehyde and lysozyme

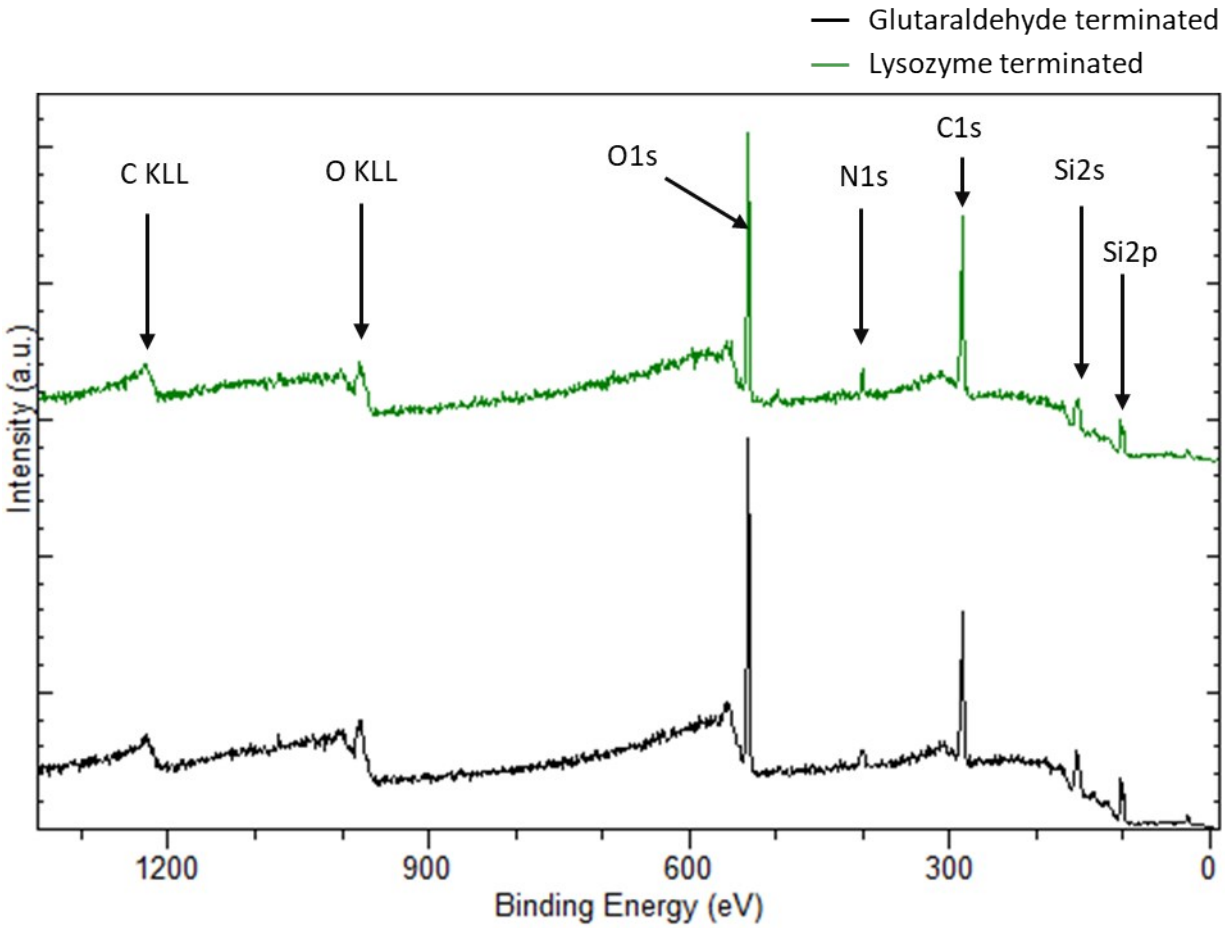

Figure S2: XPS spectra comparison of glutaraldehyde and lysozyme terminated silicon to confirm successful functionalisation with lysozyme.

Figure S1 shows the mechanism used to functionalise the silicon probes with lysozyme. To confirm whether the lysozyme is successfully immobilised, XPS spectra of glutaraldehyde and lysozyme terminated samples were obtained. Comparison between these two spectra is necessary, as the composition of the final lysozyme terminated silicon tip contains the same elements as it would after glutaraldehyde treatment. However, due to the presence of the protein, the quantity of carbon, oxygen and nitrogen is higher. As seen in **Figure S2,** the intensity of the C1s, O1s and N1s peaks for the lysozyme terminated sample is higher than that of the glutaraldehyde terminated sample. The atomic concentration of nitrogen doubles after the final cross-linking step with lysozyme. This is attributed to the presence of amino acid rich lysozyme terminating the sample. This confirms the successful functionalisation of silicon with lysozyme.

Surface roughness and water contact angle measurements

Surface roughness was measured by AFM (Flex-Axiom, Nanosurf), using an unmodified tip (PPP-CONTR, Nanosensors). The water contact angle was measured using the sessile drop method on a Kruss DSA 100 system. In both cases, PET films prepared on silicon wafers with subsequent modification were used to measure these properties.

Table S1: Summary of measured surface properties of each short-chain modification type.

Property	Modification type			
	PPG-NH_2	**PEG-NH_2**	**NH_2-PPG-NH_2**	**NH_2-PEG-NH_2**
Water contact angle (°)	52±5	60±4	58±18	59±3
Root mean squared roughness (nm)	1.4±0.6	1.3±0.3	0.8±0.3	1.3±0.3

The water contact angle and surface roughness do not change significantly between the different types of short-chain moieties. However, as the XPS spectra in **Figure 3** confirmed the presence of bifunctional and monofunctional PPG and PEG, this is because of the low grafting density, due to the lack of carboxylic acid sites that are available for modification on the PET[1].

References

1. A. Papra, H.G. Hicke and D. Paul, *J. Appl. Polym. Sci.*, 1999, **74**, 1669-1674.