Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting Information

Surfaces with Antifouling-Antimicrobial Dual Function via Immobilization of Lysozyme on Zwitterionic Polymer Thin Films

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Supplementary Text

Composition of Copolymer Thin Films

Composition of the DVB in the copolymer thin film was first calculated using FTIR spectra, as described in the main text, which led to a 16.6% DVB in all copolymer films. For the remaining 83.4%, fluorine-to-nitrogen ratio in the XPS survey scan was used to calculate the composition of PFPMA and 4VP. Specifically, the percentage of the hydrophobic monomer (F_{PFPMA}) can be calculated as follows:

$$F_{PFPMA} = (1 - F_{DVB})\frac{\frac{F}{5}}{N + \frac{F}{5}} \quad [1]$$

Supplementary Figures

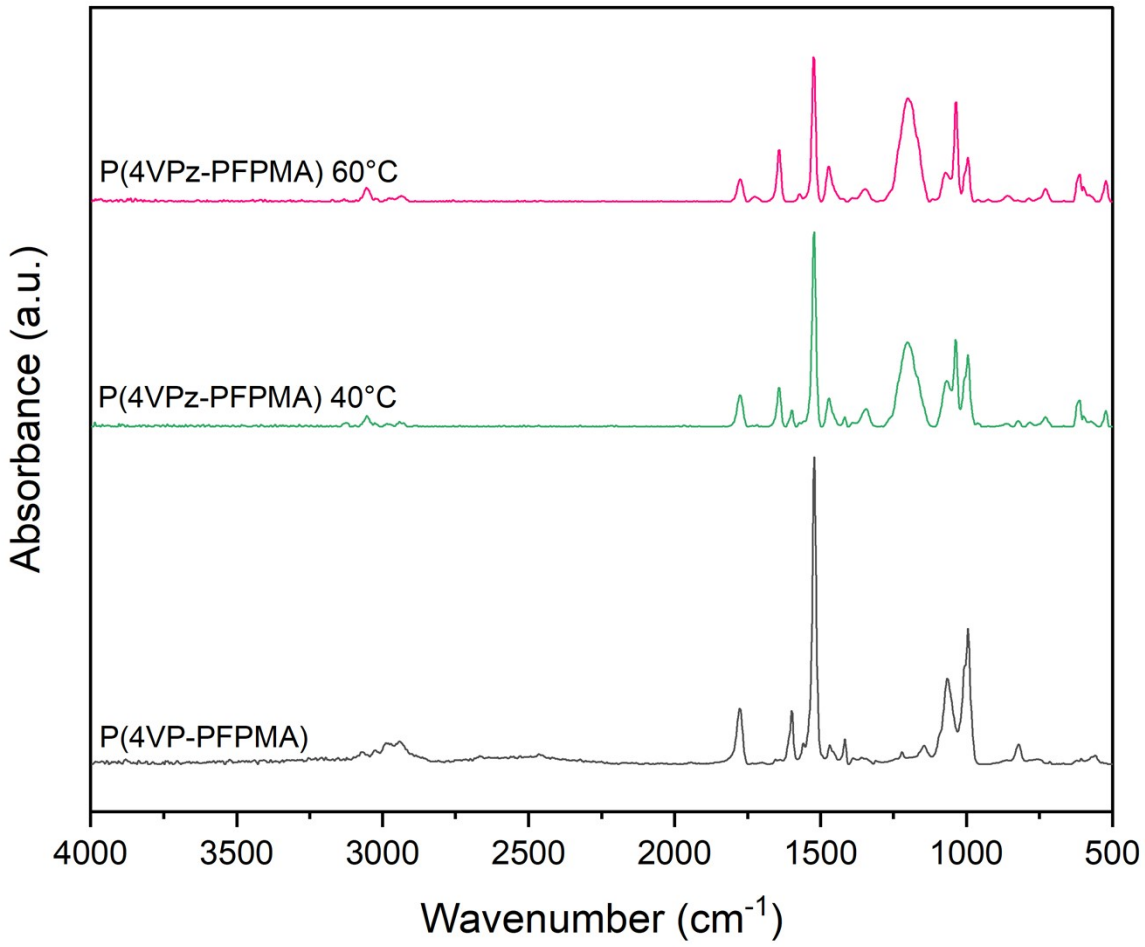

Figure S1. FTIR spectra of P(4VP-PFPMA) and P(4VPz-PFPMA) thin films after 1,3-propane sultone treatment at various temperatures over a period of 6 hours.

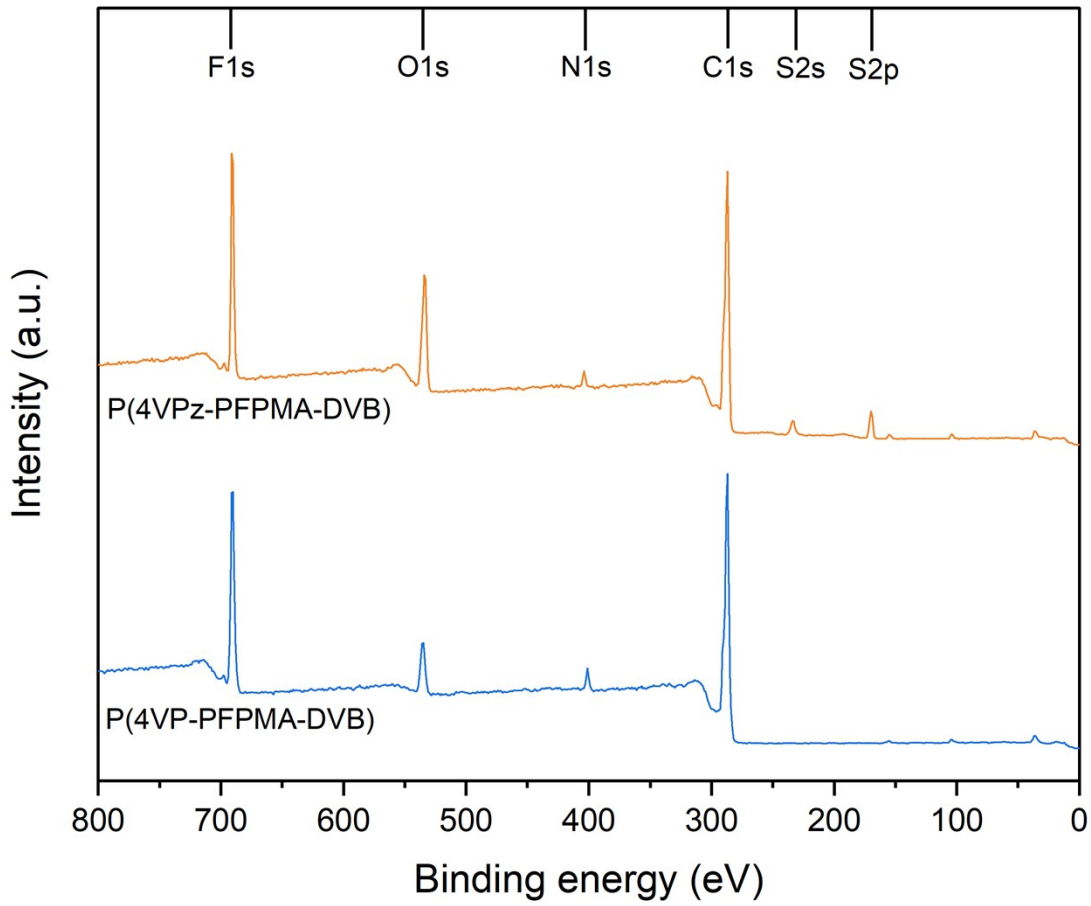

Figure S2. XPS survey scans of P(4VP-PFPMA-DVB) with and its zwitterionic derivative, P(4VPz-PFPMA-DVB) with 43.5 ± 5.6% PFPMA.

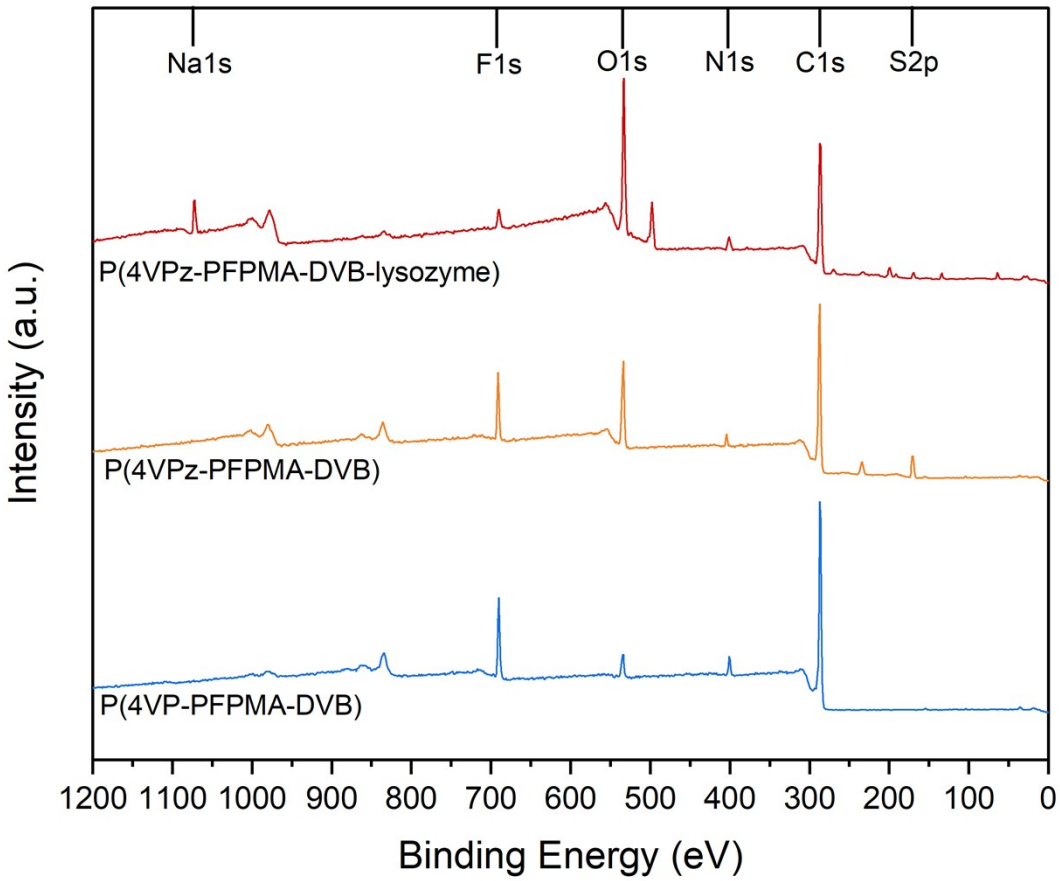

Figure S3. XPS survey scans of P(4VP-PFPMA-DVB) with 21.8 ± 6.8% PFPMA, its zwitterionic derivative, P(4VPz-PFPMA-DVB), and the zwitterionic derivative after the lysozyme immobilization, P(4VPz-PFPMA-DVB-lysozyme).

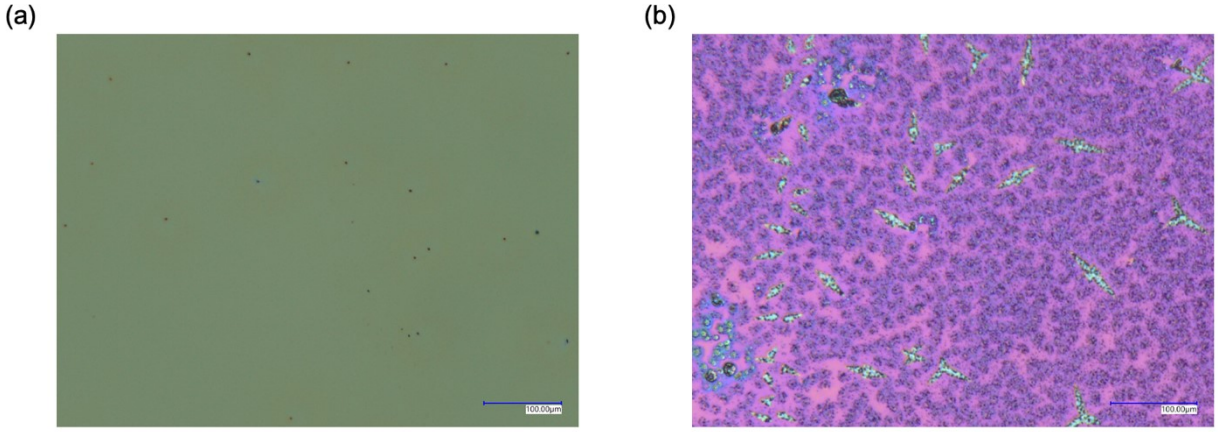

Figure S4. Top-surface images of P(4VP-PFPMA-DVB-lysozyme) with (a) 43.5 ± 5.6%, and (b) 21.8 ± 6.8% PFPMA, with the latter showing partial dissolution. The images were collected using Keyence VHX-970F digital microscope. The scale bar is equivalent to 100 µm.

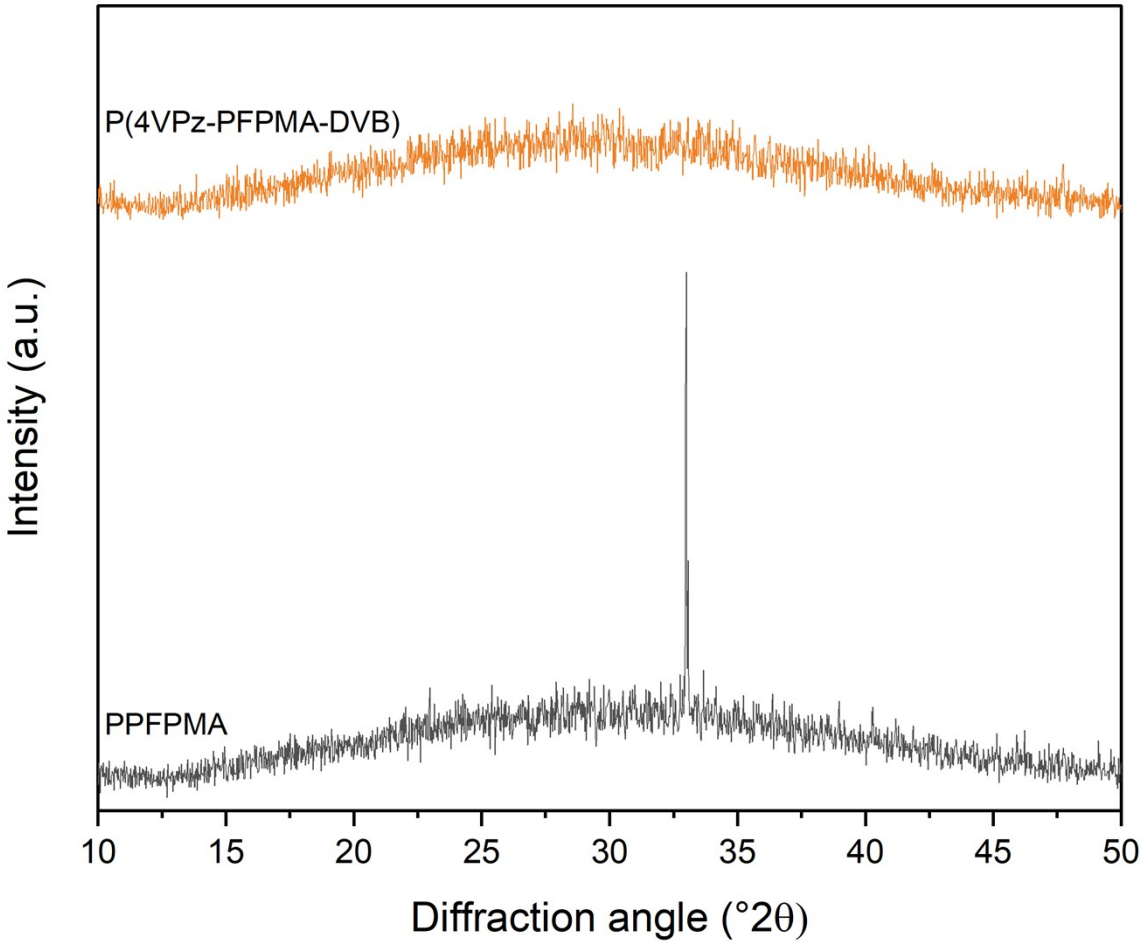

Figure S5. XRD of PPFPMA homopolymer and P(4VPz-PFPMA-DVB). The peak at 33° is due to the Silicon wafer (corresponding to the Si (111) plane],[1] on which the polymer thin films were deposited.

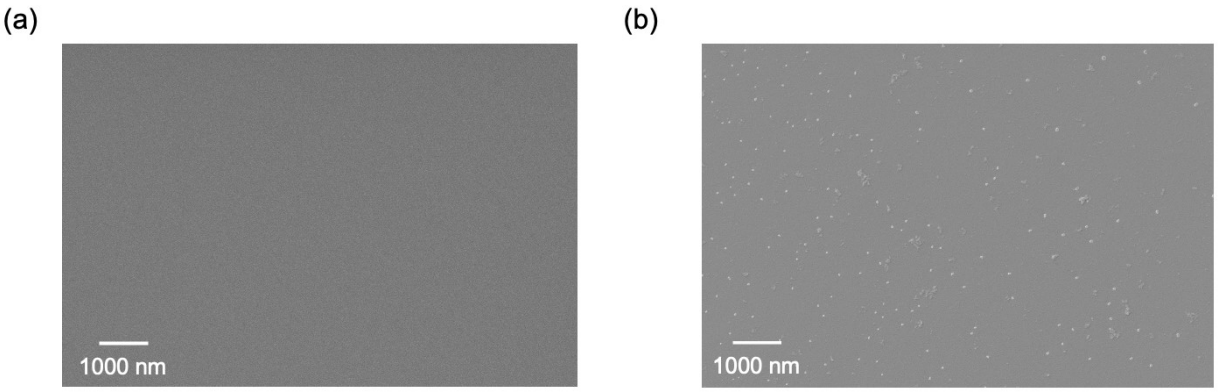

Figure S6. SEM top-down images with image size of 10 μm of (a) P(4VPz-PFPMA-DVB) and (b) P(4VPz-PFPMA-DVB-lysozyme) thin films.

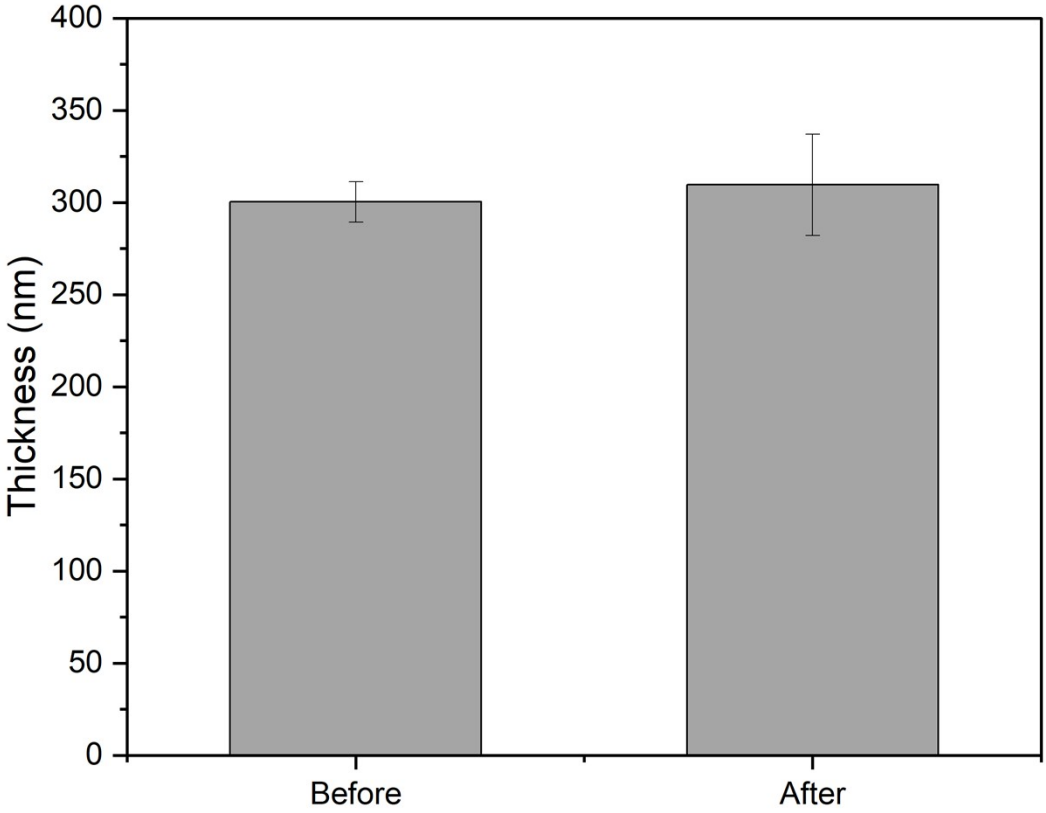

Figure S7. Coating thickness of P(4VPz-PFPMA-DVB) before and after the incubation in LB medium for 8 hours.

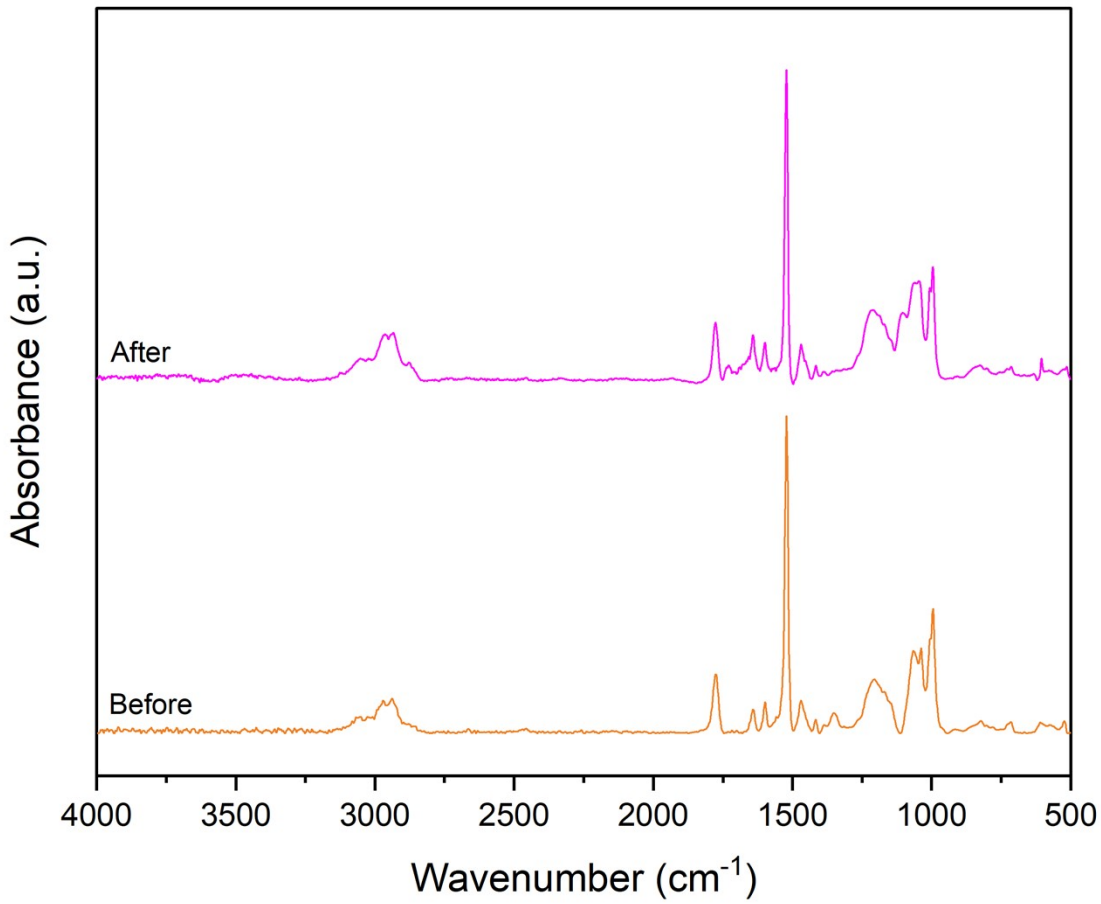

Figure S8. FTIR spectra of P(4VPz-PFPMA-DVB-lysozyme) before and after incubation in LB medium for 8 hours at 37°C.

Supplementary Tables

Table S1. Elemental compositions of P(4VPz-PFPMA-DVB) with 21.8 ± 6.8% PFPMA before and after the enzyme immobilization step, calculated from their XPS survey scans. The coating partially dissolved after the enzyme immobilization reaction upon visual examination. P, Cl and Na peaks come from PBS due to partial dissolution of the P(4VPz-PFPMA-DVB-lysozyme).

Sample	O %	C %	N %	F %	S %	P, Cl, Na %
P(4VP-PFPMA-DVB)	3.80	86.36	3.55	6.28		
P(4VPz-PFPMA-DVB)	14.04	73.02	1.92	5.02	6.00	
P(4VPz-PFPMA-DVB-lysozyme)	26.93	51.16	7.76	0.59	0.72	12.83

Supplementary References

1 M. Asghar, M. Y. Shahid, F. Iqbal, K. Fatima, M. A. Nawaz, H. M. Arbi and R. Tsu, *AIP Advances*, 2016, **6**, 035201.