

Supporting Information for:

Generic Top-functionalization of Patterned Antifouling Zwitterionic Polymers on Indium Tin Oxide

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I. Experimental setup for the photochemical grafting of 5-hexen-1-ol



Figure S1. The quartz reactor and the UV lamp used for the photochemical grafting of 5-Hexen-1-ol on ITO substrate.

II. XPS spectrum of 5-hexen-1-ol grafted sample stored in air for 2 weeks

5-hexen-1-ol grafted sample was stored in air for 2 weeks and characterized by XPS. C 1s narrow scan in Figure S2 shows a new peak at 289 eV which is characteristic for carboxylic acid. The carboxylic acid is very likely to originate from the oxidation of aldehydes as alcohol groups do not oxidize in air.

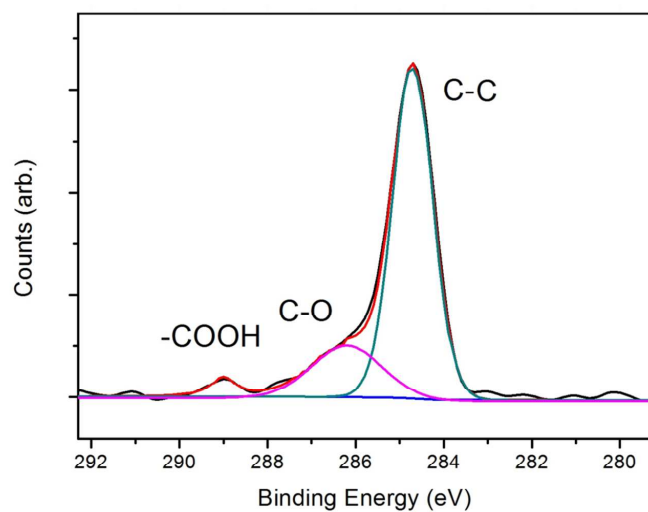


Figure S2. XPS C 1s narrow scan of 5-hexen-1-ol grafted ITO sample stored in air for two weeks.

III. Photopatterning of the initiator organic layer on ITO.

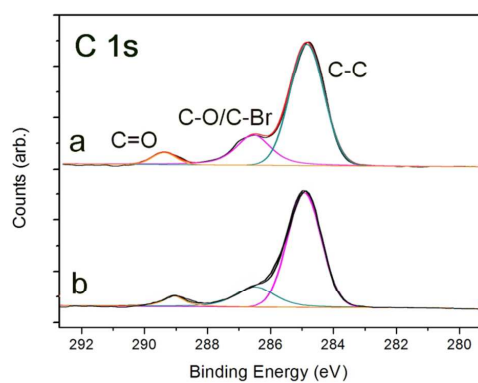
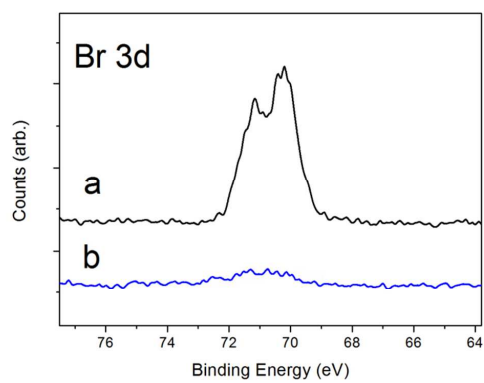
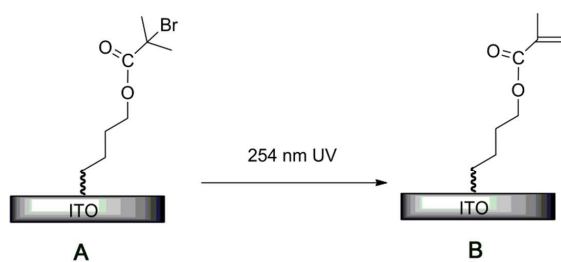


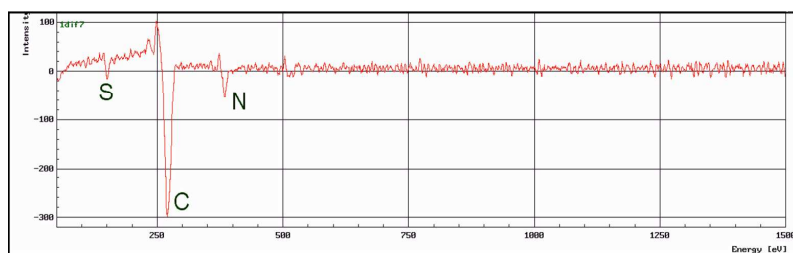
Figure S3. High-resolution Br $3d$ and C $1s$ scan of initiator organic layer (a) before and (b) after the 254 nm UV irradiation.

Organic layer of initiator on ITO (substrate A in Figure S2) was patterned via UV irradiation through gold photomask. The degradation of C-Br was confirmed using XPS. As shown in Figure S2, the peak for the Br 3d around 70 eV was decreased to noisy level after 30 min UV irradiation.

We also recorded the C 1s narrow scan, in order to probe the chemical structure on the surface after UV irradiation. It was found that the peak corresponding to C-O/C-Br considerably decreased, while the signal of C=O retains, which suggesting the selectively break of C-Br bond. Since the photopatterning was carried out in Ar-glove box, the substrate **B** (Figure S2) is one of the most likely structures after UV irradiation considering the slight decrease of the binding energy of C=O (from 289.3 eV to 289.1 eV) due to conjugation with the C=C bond. In addition, a slight increase of water contact angle of the substrate after UV irradiation (from 75° to 78°) was also observed, indicating the formation of less polar functionality.

IV. Auger spectra of the patterned ITO substrate

a:



b:

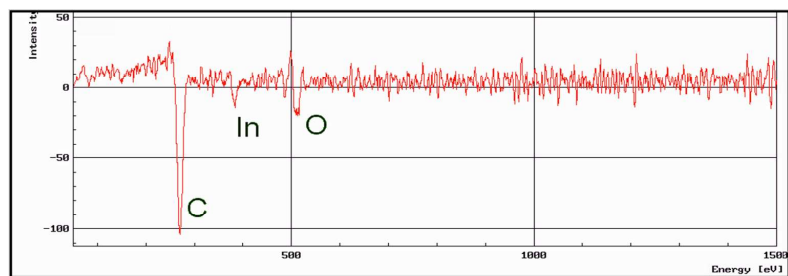


Figure S4. Auger spectra of patterned ITO surface: (a) zwitterionic polymer coated region and (b) area without zwitterionic polymer. The signal was enhanced by 1st differentiation.

V. AFM characterization of the thickness of Zwitterionic Polymer coating

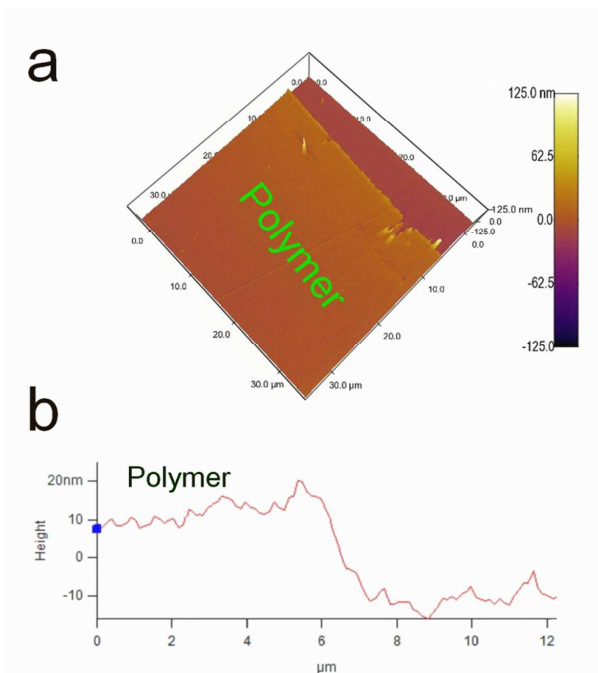


Figure S5. (a) AFM topography image of ITO substrate with polySBMAA pattern and (b) the corresponding step height images of polySBMAA grafted ITO.

V. Stability Test of the Zwitterionic Polymer Coating on ITO

To study the stability of the polySBMAA coating, the modified ITO substrates were immersed in PBS buffer (pH=7.2) for 5 days. The obtained wide-scan XPS spectrum still shows negligible amount signals from the substrate ($\text{In}\% < 2\%$), indicating the excellent stability of the polymer coating in aqueous solution. In addition, the water contact angle values remained lower than 15° throughout the stability test.

The antifouling behavior was verified again by the adsorption of FITC-BSA on the patterned ITO substrate. The clear fluorescent pattern observed in Figure S4 suggests the protein repellent property does not deteriorate after the extended incubation in PBS buffer.

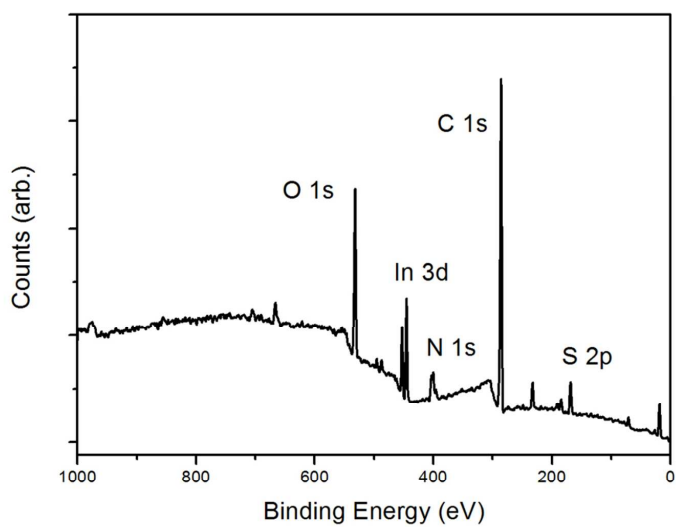


Figure S6. Wide-scan XPS spectrum of polySBMAA coating on ITO substrate after incubation in PBS buffer (pH=7.2) for 5 days.

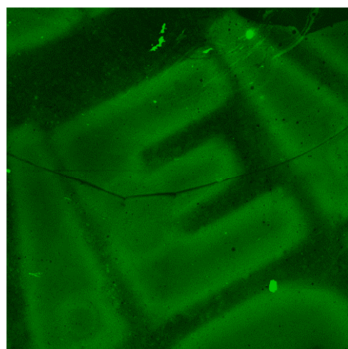


Figure S7. The fluorescent image of non-specific adsorption of FITC-BSA on ITO substrate with patterned zwitterionic polymer. Prior to the test, the substrate has been immersed in PBS buffer (pH=7.2) for 5 days.