

Supplementary Materials for

An imidazolium-based zwitterionic polymer for antiviral and antibacterial dual functional coatings

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Supplementary Text

The method for calculating the copolymer compositions

Assuming the polymer films follow the Beer–Lambert law, and the ratio of the residual vinyl bonds does not change with the content of DVB, the area-under-the-peak for the double absorption at 1228 cm^{-1} and 1284 cm^{-1} and that for the adsorption at 2871 cm^{-1} were normalized by the thickness of the homopolymer films respectively and used as the absorptivity per thickness for VI and DVB, i.e., r_{VI} and r_{DVB} in the equation below. The film composition was calculated using the equation below, where A represents area under the peak, M represents the molecular weight, and PDVB and PVI were assumed to have the same density:

$$\frac{VI}{DVB} = \frac{\frac{A_{VI}}{r_{VI} \times M_{VI}}}{\frac{A_{DVB}}{r_{DVB} \times M_{DVB}}}$$

Supplementary Figures

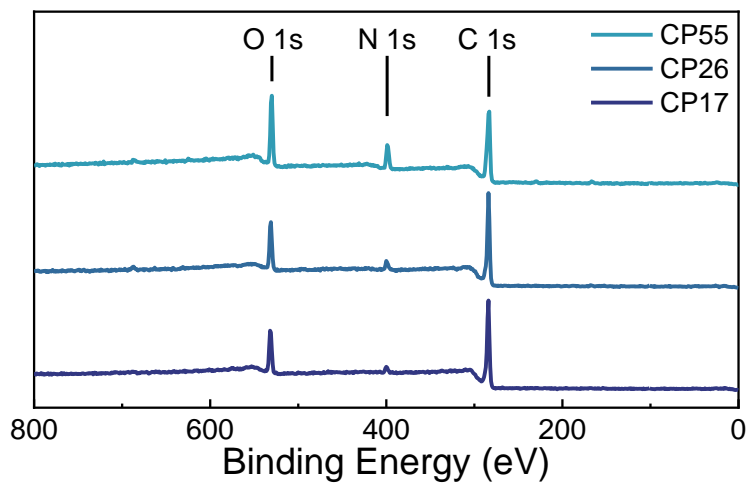


Figure S1. XPS survey scan of CP55, CP26 and CP17, demonstrating the presence of O, N, and C elements in the copolymers.

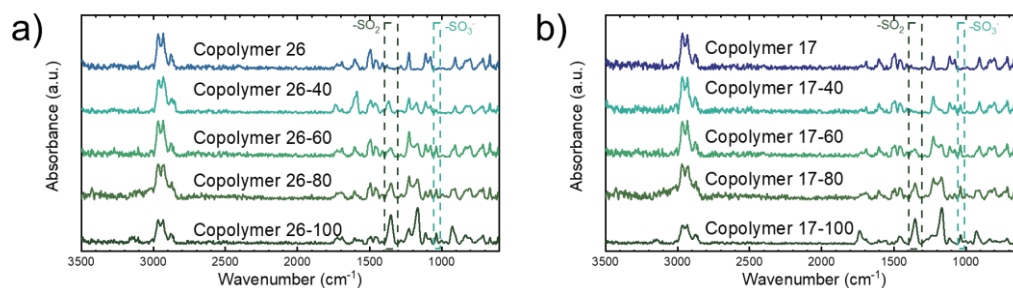


Figure S2. Characterization of CP26, CP17 and their derivatives using FTIR. FTIR spectra of a) copolymer 26 (i.e., CP26 in the main text) and b) copolymer 17 (i.e., CP17 in the main text), and those treated by a vapor of 1,3-propanesultone at the derivatization temperatures of 40°C, 60°C, 80°C and 100°C.

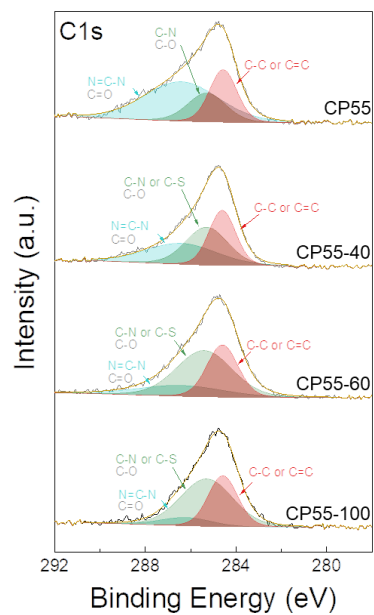


Figure S3. XPS high-resolution scans of C(1s) of CP55, CP55-40, CP55-60 and CP55-100.

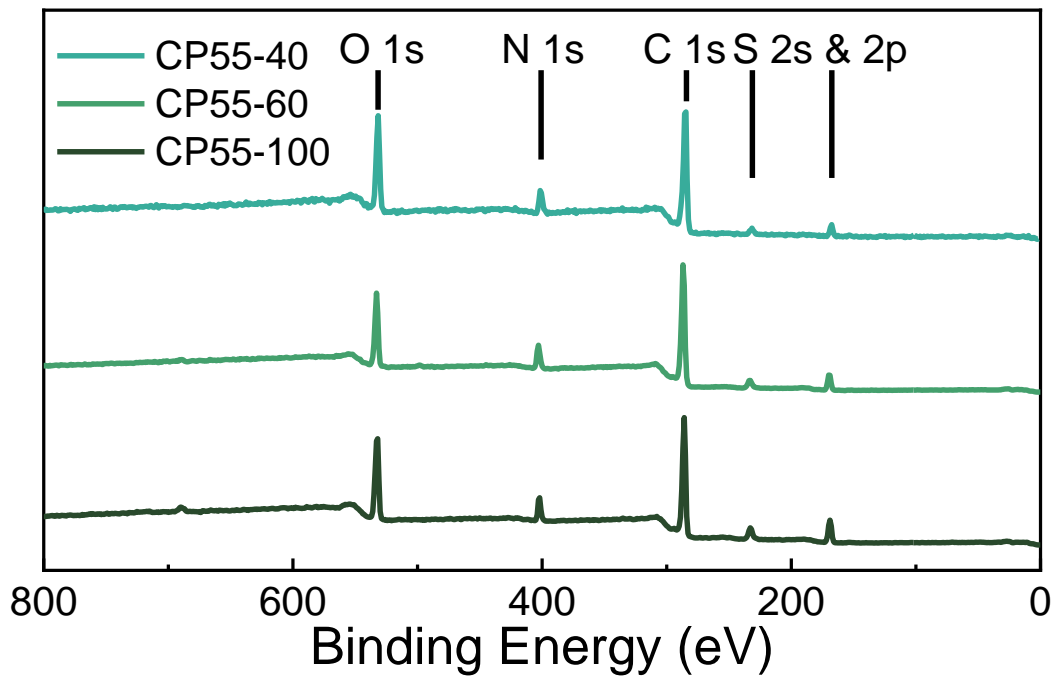


Figure S4. XPS survey scans of CP55-40, CP55-60, CP55-100.

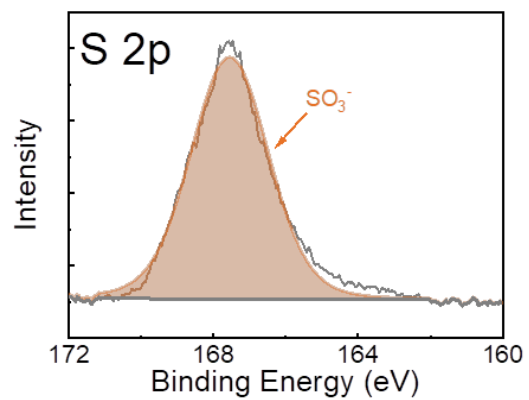


Figure S5. XPS high-resolution scans of S(2p) of CP55-60.

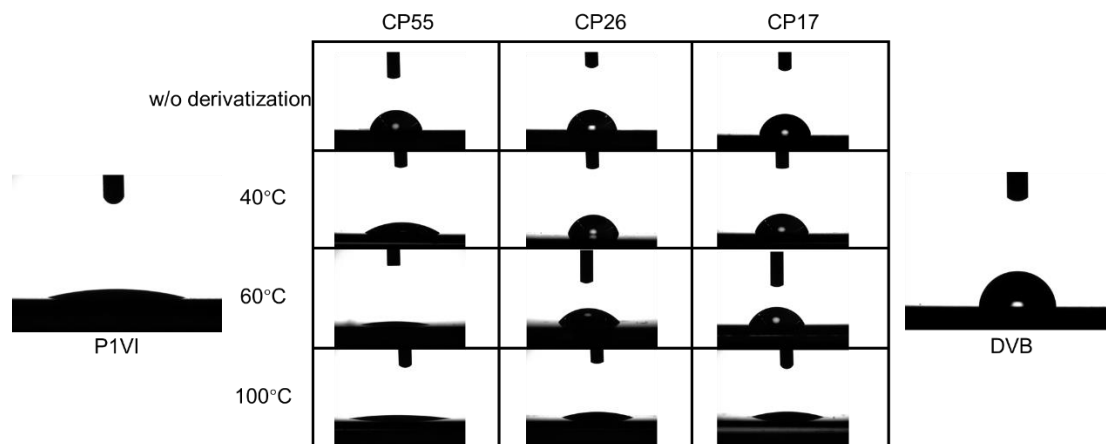


Figure S6. Images of the static water droplets on P1VI (homopolymer), PDVB (homopolymer), CP55, CP26, and CP17, and those treated by a vapor of 1,3-propanesultone at the derivatization temperatures of 40°C, 60°C, 80°C and 100°C respectively.

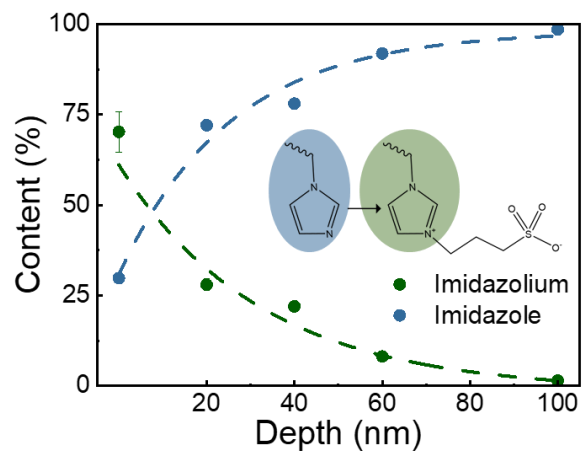


Figure S7. Depth profiling of imidazolium and imidazole contents in CP55-60.

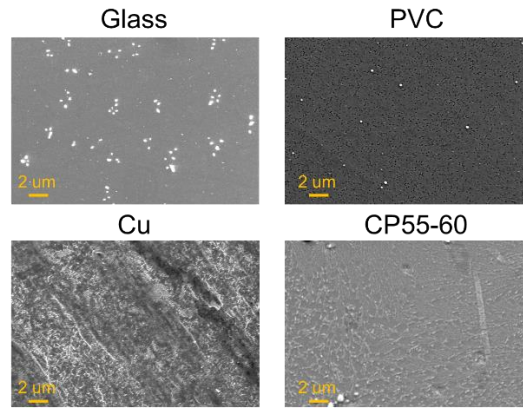


Figure S8. SEM images of the attached virus particles on glass, PVC, copper foil (i.e., Cu), and CP55-60 surfaces.

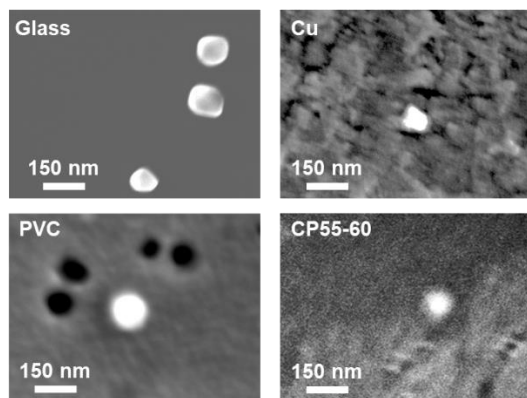


Figure S9. High-magnification SEM images of the attached virus particles on glass, PVC, copper foil (i.e., Cu) and CP55-60 surfaces.

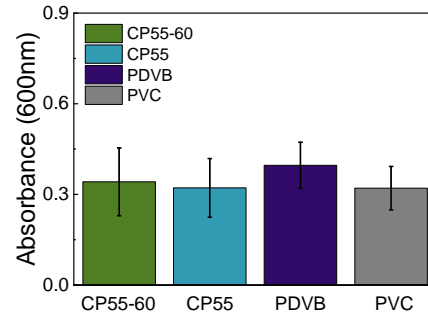


Figure S10. OD_{600} of the culture medium after a 24-h incubation with uncoated PVC and PVC coated with PDVB, un-derivatized CP55 and the CP55-60.

Supplementary Table

Table S1. Elemental compositions of CP55, CP26, CP17 by analyzing Figure S1.

| Materials | C% (%StDev) ^a | N% (%StDev) ^a | O% (%StDev) ^a |
|-----------|--------------------------|--------------------------|--------------------------|
| CP55 | 67.1 (0.4) | 11.8 (0.3) | 21.1 (0.3) |
| CP26 | 79.0 (0.4) | 4.8 (0.4) | 16.2 (0.3) |
| CP17 | 81.1 (0.4) | 3.1 (0.3) | 15.8 (0.3) |

a. StDev represents the standard deviation.