Supporting Information

Solvent-free, Ultrafast and Ultrathin PDMS Coating Triggered by Plasma for Molecule Separation and Releasing

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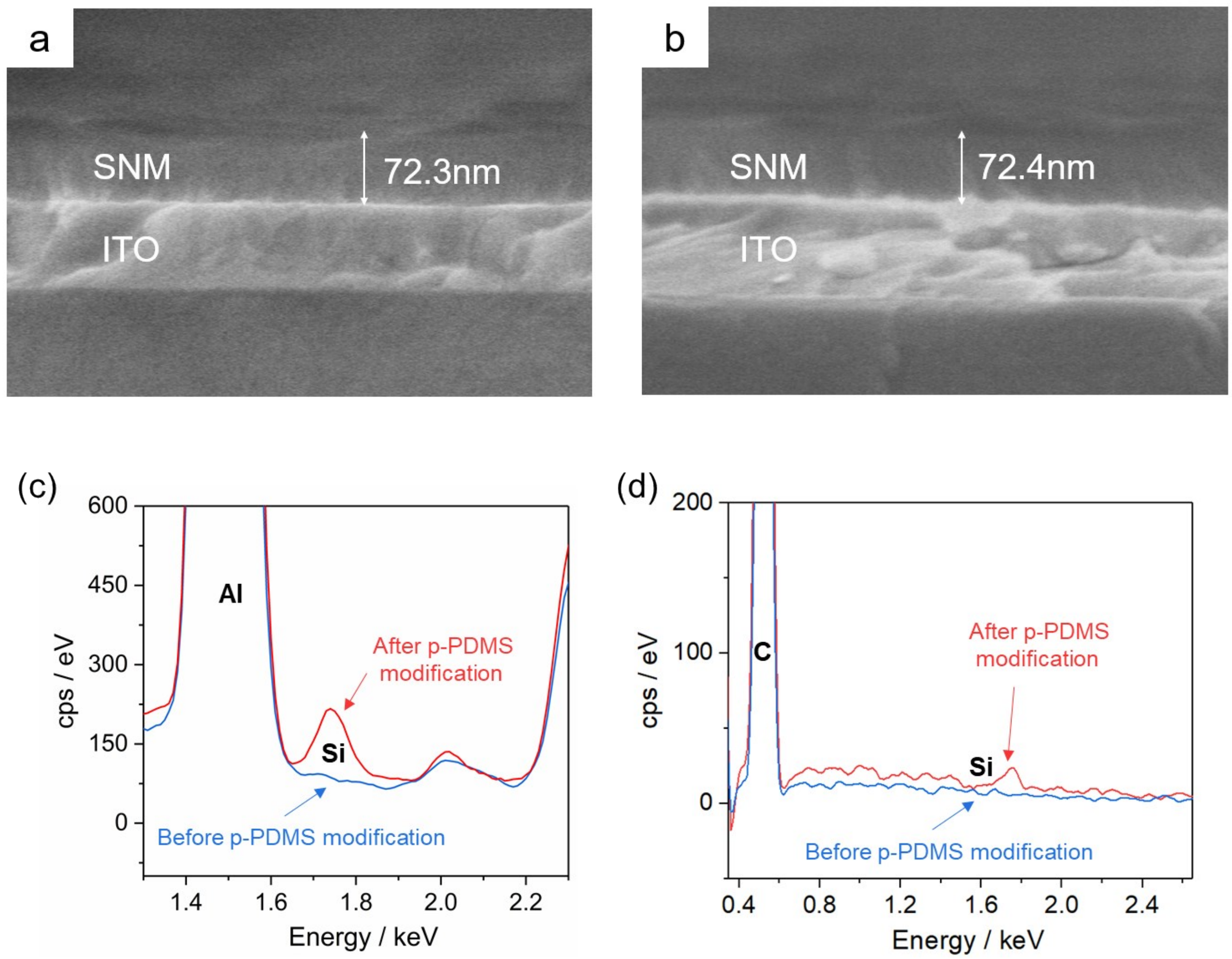

Figure S1. (a,b) Cross-sectional SEM images of SNM (a) and PDMS modified SNM (b). (c,d) X-ray energy spectrum of AAO (c) and PET (d) before and after p-PDMS modification.

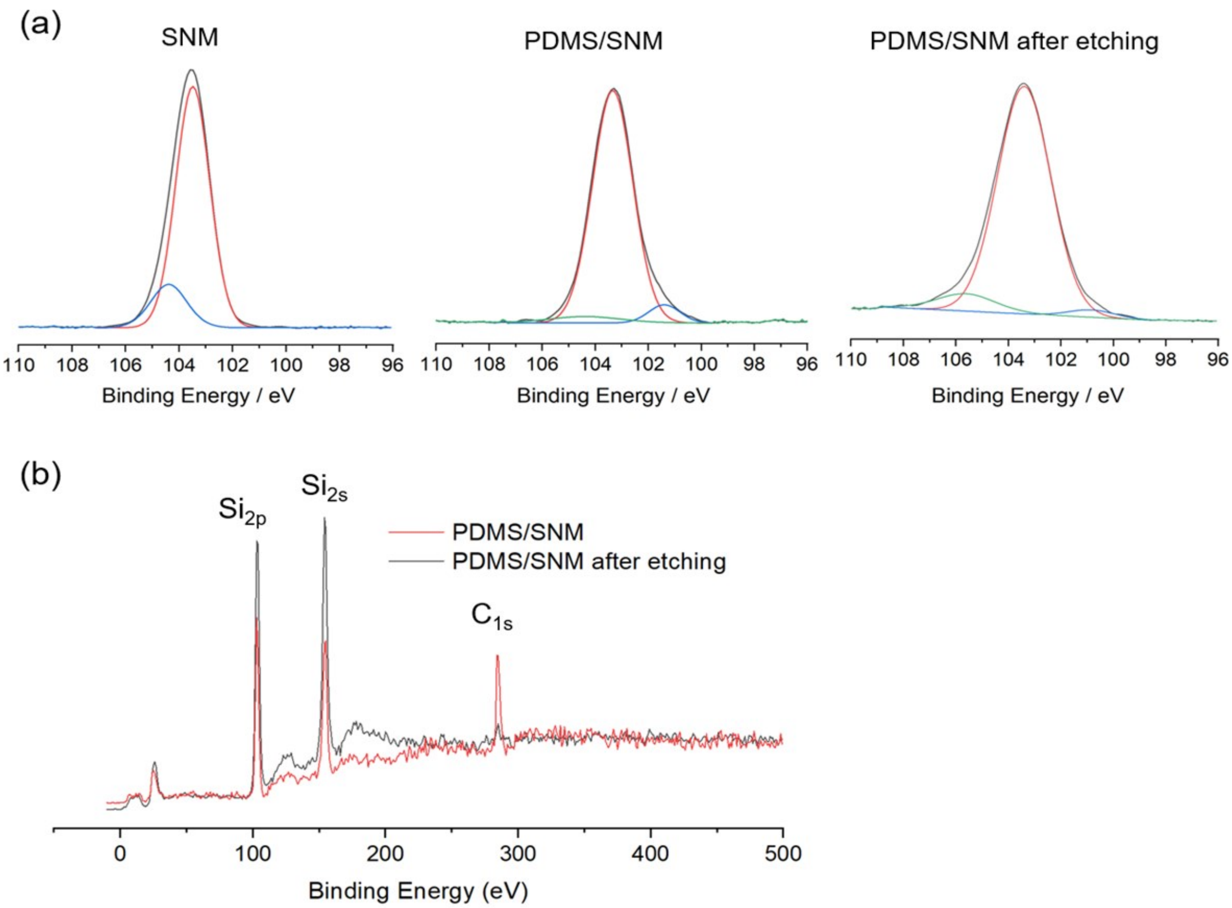

Figure S2. (a) Single peak fitting of Si_{2p} for SNM, PDMS/SNM and PDMS/SNM after Ar^+ beam etching. (b) Si_{2p}, Si_{2s} and C_{1s} Peak signal before and after etching of PDMS/SNM.

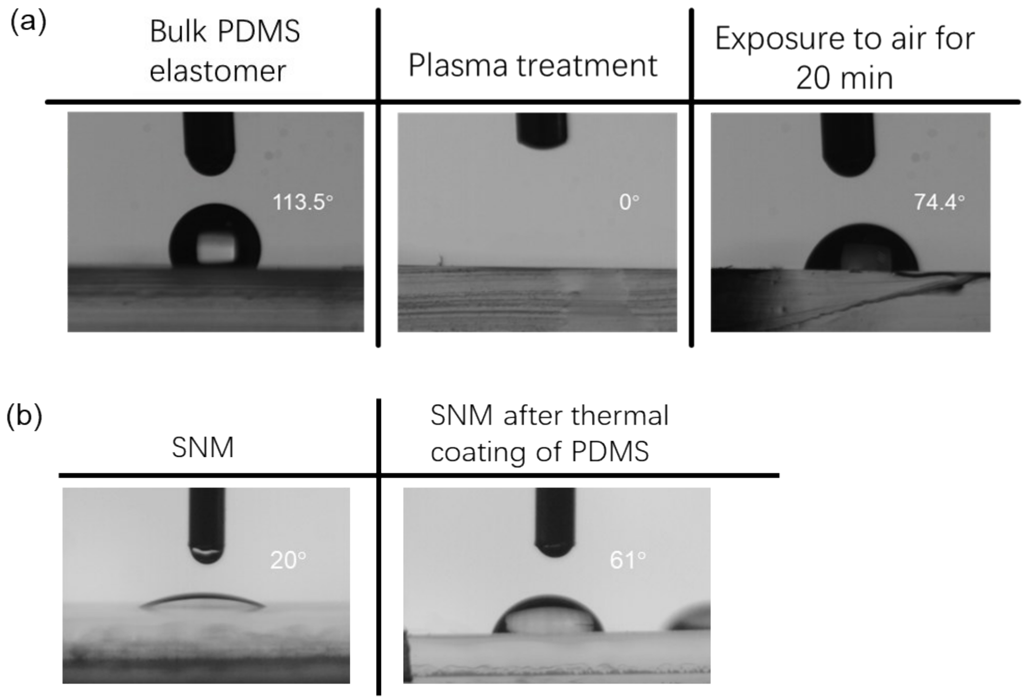

Figure S3. (a) The contact angle of bulk PDMS before and after plasma treatment and subsequent exposure to air. (b) The contact angle of SNM before and after conventional thermal coating of PDMS. Bulk PDMS elastomer was put on the top of the SNM with a distance of about 1 mm and heated at 100 °C for 10 h.

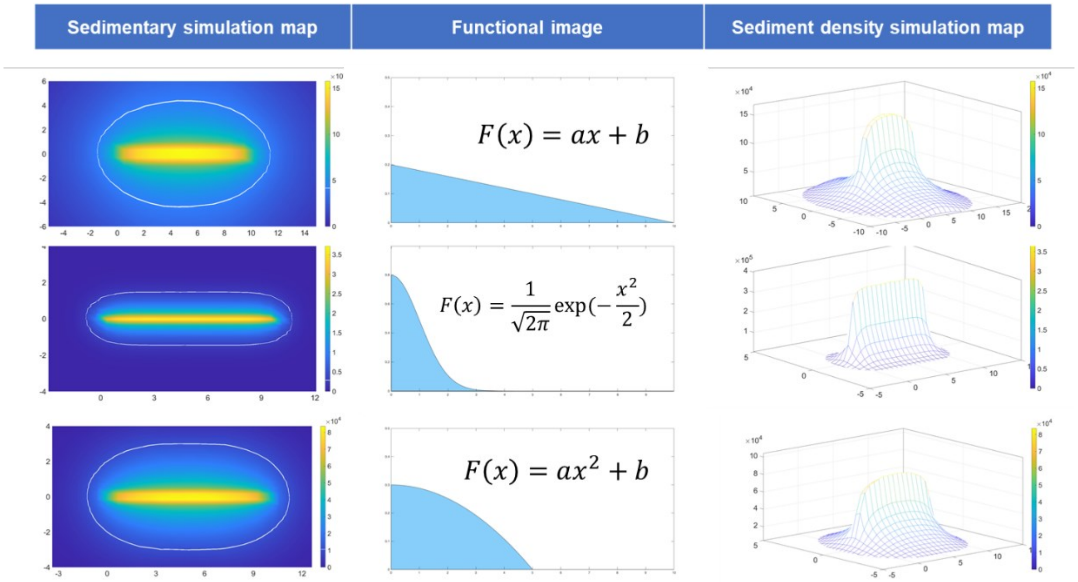

Figure S4. Simulation of linear PDMS deposition under different oligomers distribution patterns. From top to bottom, it's linear, normal, and quadratic, respectively. Only the analytic solutions of linear distributions can obtain standard ellipses. When a higher-order term (exponent greater than 1) occurs, the analytic solution will fail to produce an ellipse. But if the coefficient of the higher-order term is very small, the simulation can obtain an approximate ellipse. The simulation was based on other distribution patterns only show a profile with a rounded rectangle shape.

Supplementary Note 1. Detialed calculation step for boundary equation of PDMS coating

Derivation of the fluorescence boundary equation under the condition of linear deposition of PDMS oligomers.

$$\int_{-c}^{c} \frac{F(d)}{2\pi d} dt = M \tag{1}$$

$$d = \sqrt{(x-t)^2 + y^2} \tag{2}$$

$$F(d) = Ad + B \tag{3}$$

By introducing Eqs. 2-3 into Eq. 1, followed Eq. S1 could be obtained.

$$\int_{-c}^{c} \frac{A\sqrt{(x-t)^2 + y^2} + B}{2\pi\sqrt{(x-t)^2 + y^2}} dt = M \tag{S1}$$

$$\frac{Ac}{\pi} + \frac{B}{2\pi}\int_{-c}^{c} \frac{1}{\sqrt{(x-t)^2 + y^2}} dt = M \tag{S2}$$

The constant terms were combined and recorded as *M'*, which can be expressed as

$$M' = \frac{2\pi M - 2Ac}{B} \tag{S3}$$

And substitute *z* for *(x-t)*. The original integral can be reduced to Eq. S4.

$$\int_{x-c}^{x+c} \frac{1}{\sqrt{z^2 + y^2}} dz = M' \tag{S4}$$

By integrating Eq.S4, Eq. S5 was obtained.

$$\ln \frac{x + c + \sqrt{(x+t)^2 + y^2}}{x - c + \sqrt{(x-t)^2 + y^2}} = M' \tag{S5}$$

$$\frac{x + c + \sqrt{(x+t)^2 + y^2}}{x - c + \sqrt{(x-t)^2 + y^2}} = e^{M'} \triangleq k \tag{S6}$$

By simplifying Eq. S6, Eq. S7 was obtained.

$$4k(k-1)^2 x^2 + (k^2 - 1)^2 y^2 = 4k(k+1)^2 c^2 \tag{S7}$$

Convert the above equation into the elliptic standard equation (Eq. 4).

$$\frac{x^2}{(\frac{k+1}{k-1})^2 c^2} + \frac{y^2}{4k(\frac{1}{k-1})^2 c^2} = 1 \tag{4}$$

Where k is a constant and can be expressed as

$$k = \exp\left(\frac{2\pi M - 2Ac}{B}\right) \tag{5}$$

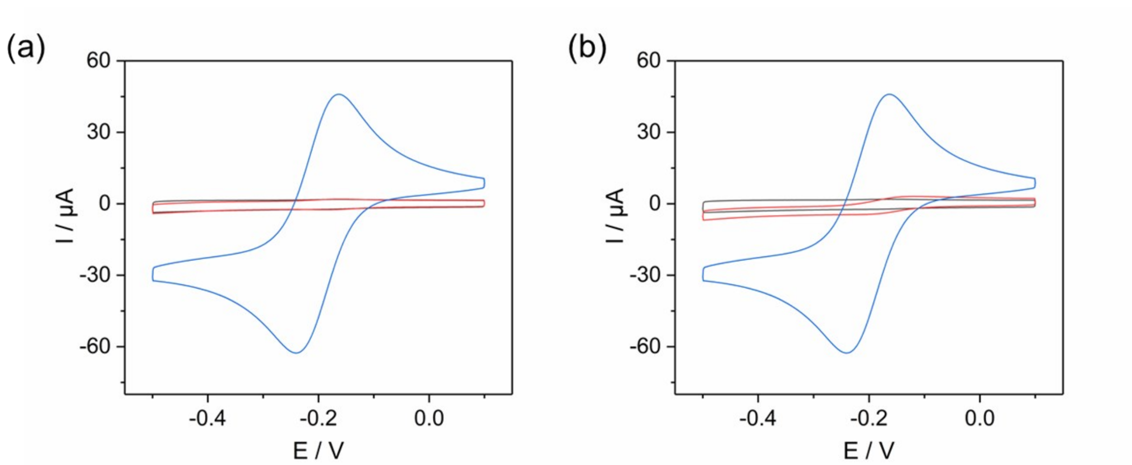

Figure S5. Cyclic voltammograms of p-PDMS/SNM/ITO before (black) and after (red) 4 h soaking in ethanol (a) and acetone (b) in 0.5 M KCl containing Ru(NH3)63+. The blue line is CV of SNM/ITO in the same solution.