

Electronic Supplementary Information

Pseudopeptide polymer coating for improving biocompatibility and corrosion resistance of 316L stainless steel

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Synthesis of PMOXA.

A typical procedure for the synthesis of PMOXA with a theoretically number-average molecular weight (\overline{M}_n) of 2.5 kD, 5 kD, and 10 kD was as follows. MeOTf (Sigma-Aldrich Chemical Co., St. Louis, MO) 229.7 μL (2.04 mmol), 114.9 μL (1.02 mmol), or 57.4 μL (0.51 mmol), MOXA ((Sigma-Aldrich Chemical Co., St. Louis, MO) 5.0 mL, 58.8 mmol) and dry acetonitrile (10.0 mL, Sinoreagent, Shanghai, China) were placed into a flame-dried Schlenk flask. The reaction mixture was stirred at 80 °C under nitrogen for 24 h. After, the reaction was quenched by addition of 6.0 mL water and 11.1 g solid Na_2CO_3 (Sinoreagent, Shanghai, China) and heated to 80 °C for another 20 h. After being cooled to room temperature, the reaction mixture was extracted with CHCl_3 (200 mL \times 3, Sinoreagent, Shanghai, China). The combined organic phases were dried over Na_2SO_4 (Sinoreagent, Shanghai, China), filtered, and then concentrated under vacuum. Finally, the product hydroxy-terminated poly(2-methyl-2-oxazoline) (PMOXA-OH) was isolated by precipitation in ice-cold ether, filtered, and vacuum dried overnight. ^1H NMR spectra of PMOXA were displayed in Fig. S1.

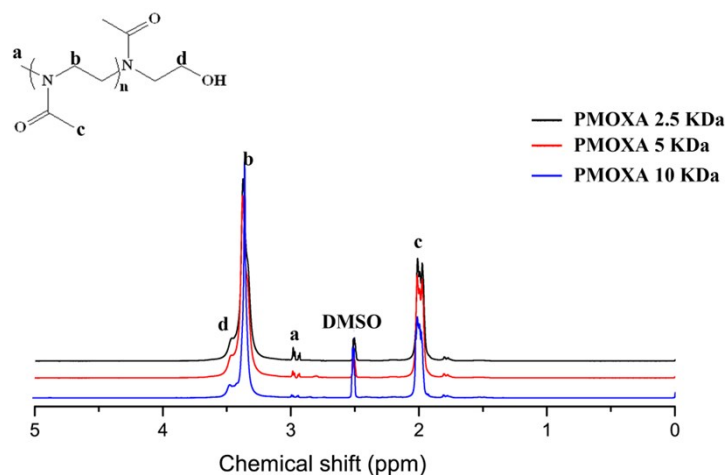


Fig. S1 ^1H NMR spectra of PMOXA with different number-average molecular weight.

The MOXA repeating unit composition of different coating was calculated by below formula:

$$\gamma_3(P_x) = \gamma_1(P_x) \times (1 - \eta(P_x)) \quad (S1)$$

$$\gamma_4(P_x) = \gamma_2(P_x) \times (1 - \eta(P_x)) \quad (S2)$$

Where $\eta(P_x)$ is the hydrolysis ratio of P_x (in Table 1); $\gamma_1(P_x)$ is the H-PMOXA composition in the P_x /dopamine coating calculated from the value of O/N; $\gamma_2(P_x)$ is H-PMOXA composition in the P_x /dopamine coating calculated from the value of C/N; $\gamma_3(P_x)$ is the MOXA repeating unit composition in the P_x /dopamine coating calculated from $\gamma_1(P_x)$; $\gamma_4(P_x)$ is the MOXA repeating unit composition in the P_x /dopamine coating calculated from $\gamma_2(P_x)$. The results were displayed in Table S1.

Table S1 The content of MOXA repeating unit (γ_3 and γ_4) in different coating.

PDA coating	γ_3	γ_4
	0	0
P ₀ /dopamine coating	19.0%	24.0%
P ₁ /dopamine coating	24.6%	29.8%
P ₂ /dopamine coating	40.1%	33.6%
P ₃ /dopamine coating	37.1%	31.9%
P ₄ /dopamine coating	34.2%	33.6%
P ₅ /dopamine coating	32.8%	31.7%

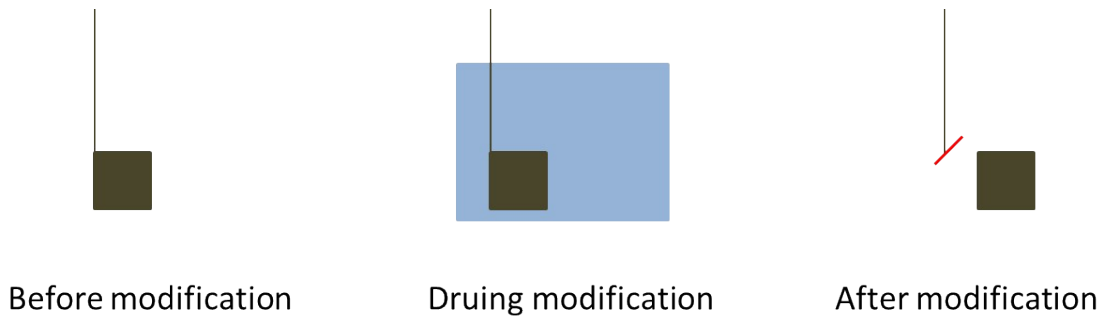


Fig. S2 The illustration of the modification of slices.

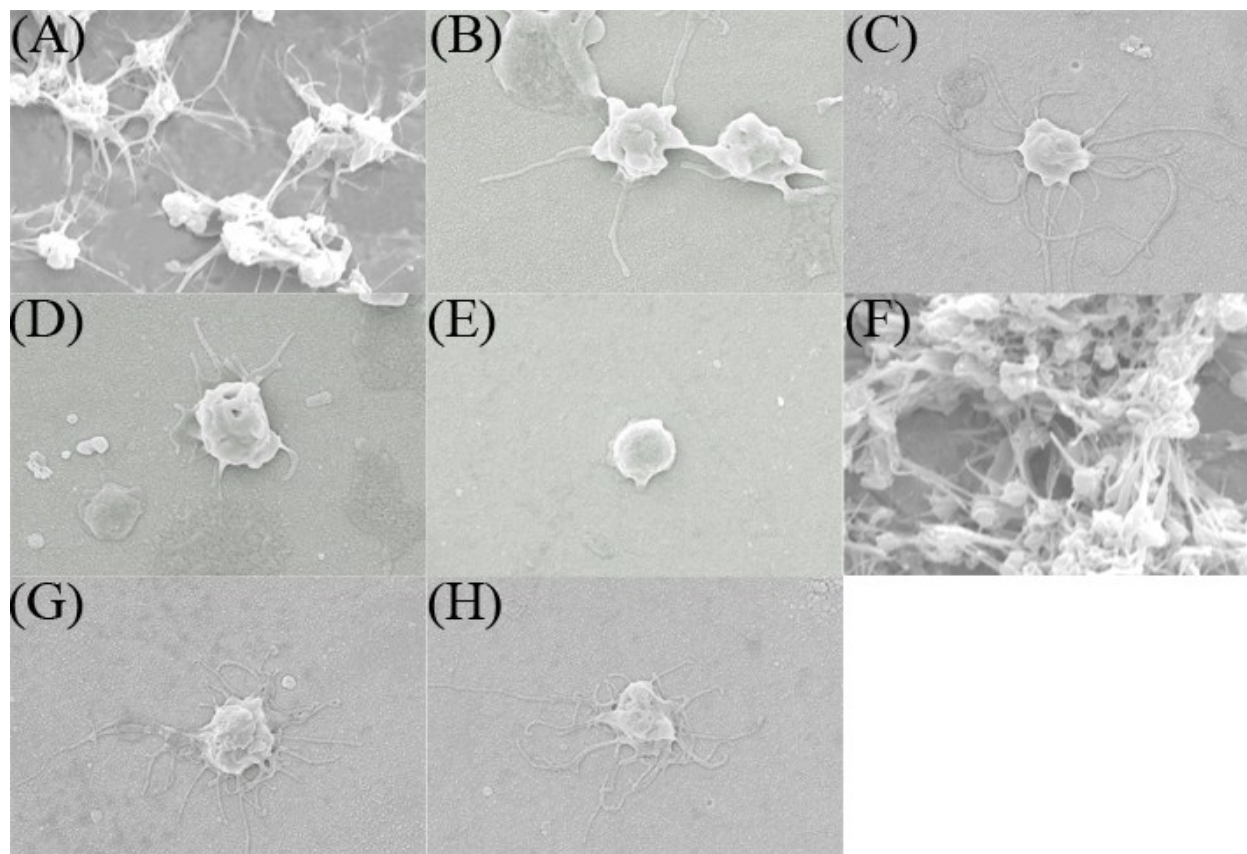


Fig. S3 The magnified SEM images of the attached platelets on bare 316L SS slice (A, $\times 10000$ image), PDA coating (B, $\times 15000$ image), P₀/dopamine coating (C, $\times 15000$ image), P₁/dopamine coating (D, $\times 15000$ image), P₂/dopamine coating (E, $\times 15000$ image), P₃/dopamine coating (F, $\times 10000$ image), P₄/dopamine coating (G, $\times 15000$), P₅/dopamine coating (H, $\times 15000$ image) modified 316L SS slices.

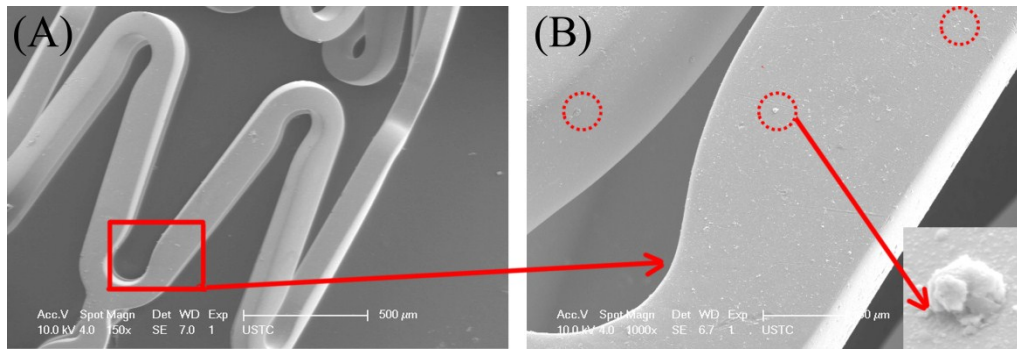


Fig. S4 The platelet attachment test on the P₂/dopamine coating modified stent after immersing in PBS for 21 days. As displayed, the result was similar to the P₂/dopamine coating modified stent after immersing in PBS for 72 h (Fig. 7).

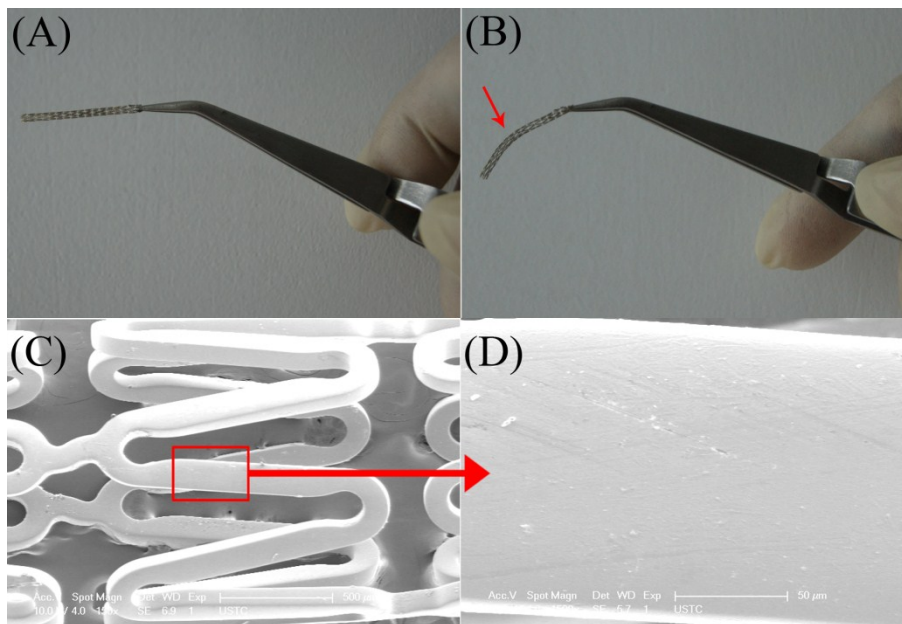


Fig. S5 The bend test of P₂/dopamine coating modified stent. After bending, the coating on the stent was observed by SEM. There are not cracking, peeling, and flaking in the coating after being bended as shown in 5D.

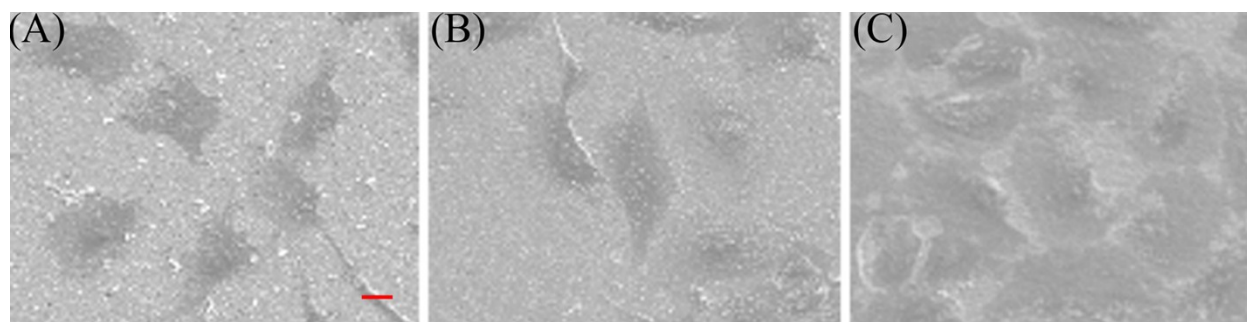


Fig. S6 The magnified SEM images of HUVECs proliferation on the bare (A), PDA coating modified (B), and P₂/dopamine coating modified (C) 316L SS slices after 24 h cell culture. The scale bar is 20 μm.

To study the cell viability of PMOXA, MTT assay was conducted to estimate the HUVECs viability of P₀, P₁, P₂, and P₃. This method represents a standard assay of cell viability, which is based on the colorimetric analyses of living cells. Seven concentrations (0.001, 0.01, 0.05, 0.1, 0.2, 0.5, and 1 mg/ml) of the studied polymers were tested. As depicted in Fig. S7, the P₀ and P₁ has good cell viability after 24 h, the survival cells of P₀ and P₁ were increased approximately 10% ~ 20%, implying that the PMOXA possess excellent cell viability. Meanwhile, the survival cells of P₂ and P₃ were lower than that of P₀ and P₁, but higher than that of the control. Obviously, compared to P₀ and P₁, cell viability of P₂ and P₃ decreased. This could be ascribed to the hydrolysis ratio and imine groups of H-PMOXA increasing. Therefore, the results above demonstrated that the PMOXA exhibit a good cell viability and the imine groups of H-PMOXA can decrease the cell viability, thus, the P₂ can be used to produce a coating for enhance endothelial cell migration and proliferation, because the imine groups of H-PMOXA will react with PDA and PMOXA segment of P₂ can cover on the surfaces fully.

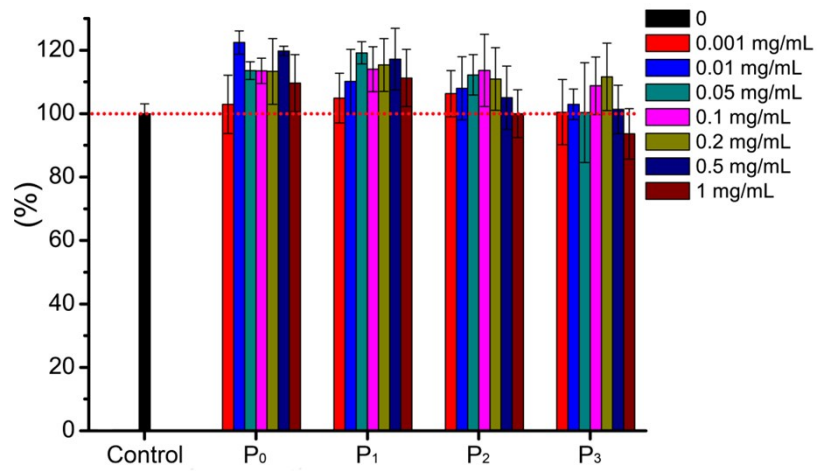


Fig. S7 Cell viability assay of HUVECs cultured in cell culture medium with PMOXA and H-PMOXAs with different concentration. The results obtained using MTT test.