A Novel Hybrid Polymer Network for Efficient Anticorrosive and Antibacterial Coatings

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Pull-off adhesion. Adhesion strength of the PDSHP layer coating on the stainless steel substrates was determined using pull-off test method by the ASTM D4541 procedure. Pull-off adhesion tester (DEFELSKO) was used. The aluminium dolly was glued on the PDSHP layer with Araldite 2015 epoxy adhesive (Huntsman advanced materials, Germany). Samples were then kept at room temperature for 24 h to ensure that the glue fully cured. The test started with pulling the dolly. During pulling the dolly, the glue on the SS-PDSHP samples has broken off (Figure S1). The color and surface at the places indicated by arrows look as the same as that at other places outside the glue circles (Figure S1). It is indicated that the pull-off test has no damage to the PDSHP layer. Therefore we conclude that the PDSHP layer adhered to the stainless steel very strongly.

Electrochemical impedance spectroscopy (EIS) measurement. EIS measurements were performed on a Princeton Applied Research Parstat 2273 instrument. The Zview software was used for experimental control and acquisition of data. EIS spectra were obtained with an AC amplitude of ±10 mV rms and a frequency range of 10^{-2}-10^{5} Hz. Measurements of cyclic voltammetry were carried out in a three-electrode cell at room temperature. 3.5% sodium chloride was used as the background electrolyte.

Table S1. Infrared bands of the hybrid polymer coatings on SS sample surfaces

Wavenumber (cm^{-1})	Assignment
3395	OH and NH stretching modes
3433	OH and NH stretching modes
2941	CH stretching vibrations
2945	CH stretching vibrations
2892	CH stretching vibrations
2883	CH stretching vibrations
1661	vring(C=O)
1657	vring(C=O)
1572	vring(C=C),vring(C=N)
1563	vring(C=C),vring(C=N)
1149	C–N stretching vibration
1140	C–N stretching vibration

1089	Si–O–Si asymmetric stretching or Si–O–C
1069	Si–O–Si asymmetric stretching or Si–O–C
920	Si-OH stretching
915	Si-OH stretching
843	Si-O-Si symmetric stretching
766	Si-O-Si symmetric stretching

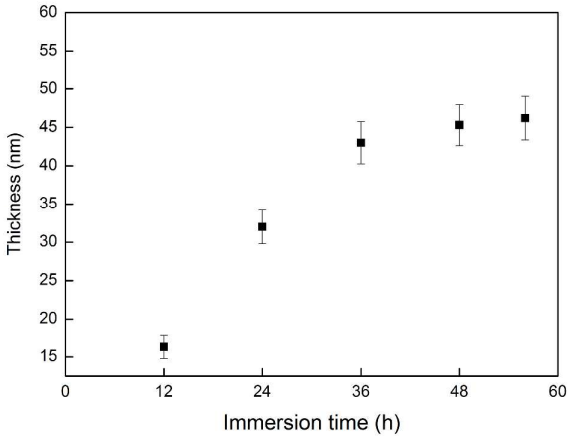
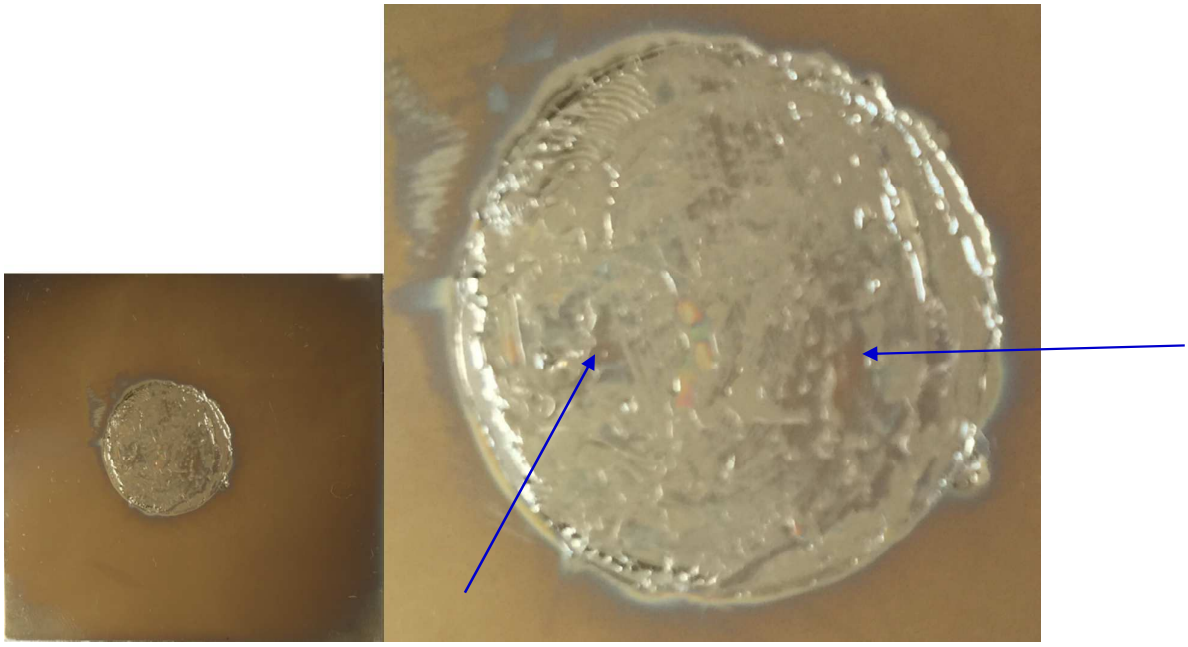
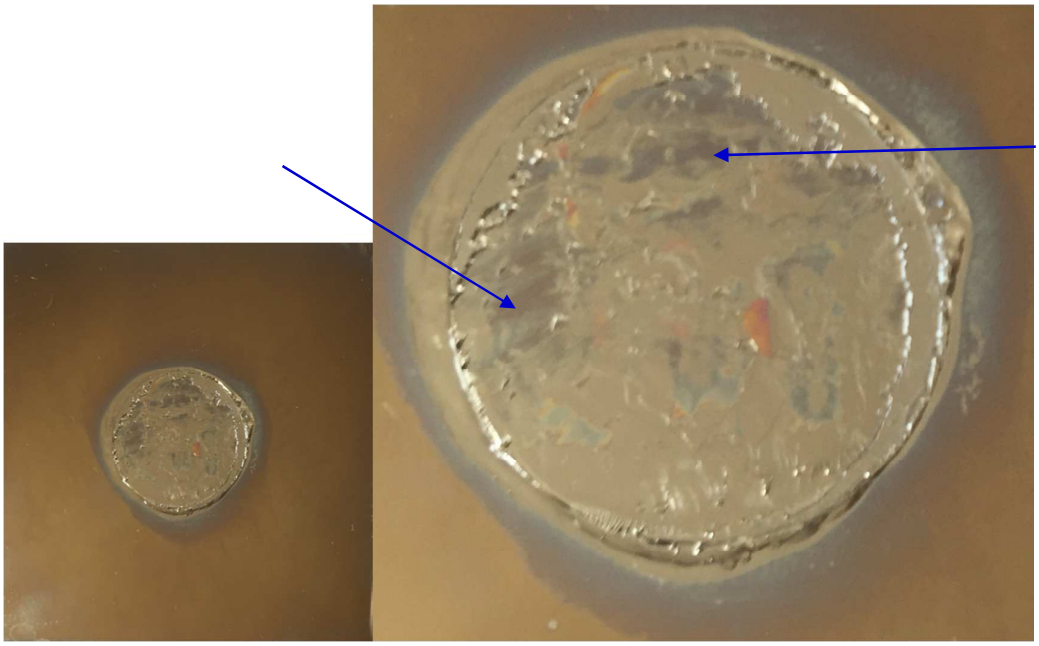


Figure S1. Thickness of the hybrid polymer PDSHP as a function of immersion time in the reaction solutions



Sample A



Sample B

Figure S2. Pull-off test for the PDSHP coated SS samples

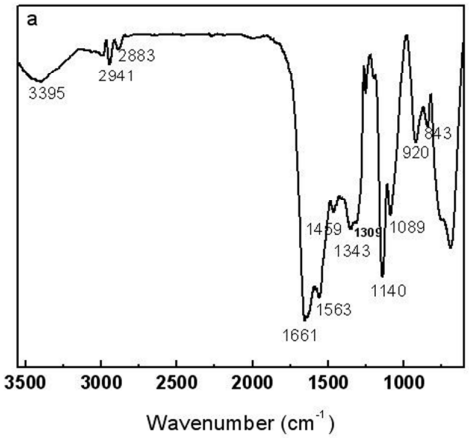


Figure S3. FTIR spectra of SS-PDSHP

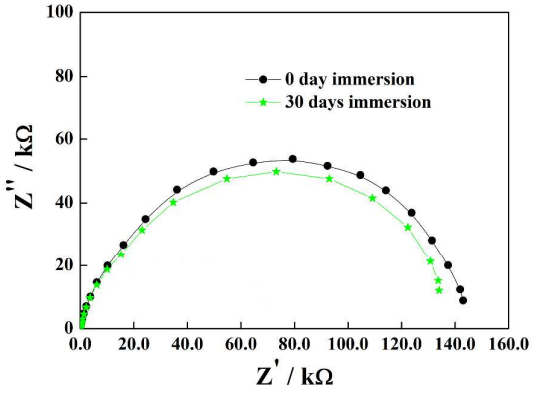


Figure S4. Nyquist plot of SS-PDSHP-PEI-CHPAC after 30 days immersion in artificial seawater

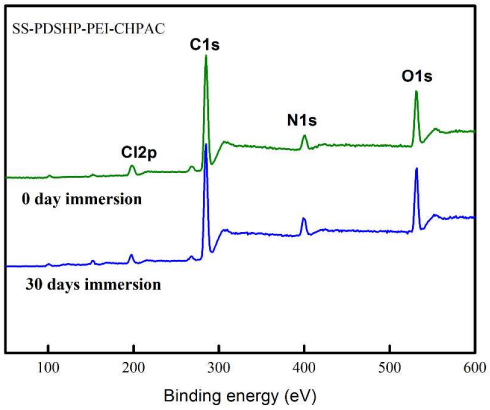


Figure S5. XPS spectrum (in blue) for SS-PDSHP-PEI-CHPAC after 30 days immersion in artificial seawater

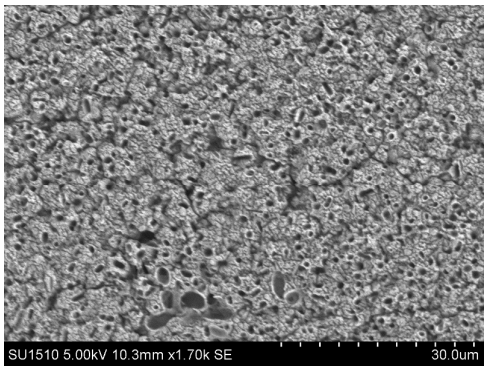


Figure S6. SEM image of the SS-polydopamine coupon after exposure in the articial seawter for 30 days.