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Layer-by-Layer Zwitterionic Modification of Diverse Substrates with Durable Anti-corrosion and Anti-fouling Properties

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ATR-FTIR spectra were recorded in a controlled chamber at 24℃ and 40% RH using a BRUKER Vertex 70 equipment (Rheinstetten, Germany) coupled with the ATR accessory GoldenGate of Specac Ltd. (Orpington, UK) in the 4,000-500 cm^{-1} range. The spectra were collected in the different materials by averaging 20 scans at 4 cm^{-1} resolution. The experiments were repeated twice to verify that the spectra were consistent between individual samples.

The morphologies of the multilayer-coated surface and coating thickness were evaluated by scanning electron microscope (SEM) (HITACHI S-4800, Hitachi). SEM was conducted at an accelerating voltage of 3 kV and a working distance of 10-15 mm. The samples were sputtered with a gold-palladium mixture under vacuum for 60 s before their morphology was examined.

Height profile and morphology of coatings were investigated with atomic force microscope (AFM) CSPM5500 (Being Nano-Instruments Ltd., China). Silicon cantilever probes with a nominal resonant frequency of 150 kHz and a force constant of 5 N/m were used for sample scanning. The typical scan rate was 0.1-0.3 line/s with a scan size of 5 by 5 × 5 μm^2. The root mean square roughness (Sq) was calculated from the roughness profile determined by the AFM software.

Kruss Easy Drop goniometer (Kruss Germany) equipped with a digital photoanalyzer was used to assess the static water contact angles. 1 μL droplet of demineralized water was dropped on the surface via a microsyringe. For each sample, the measurement was repeated five times at different positions to obtain the average

value of contact angle. The measurements were conducted in a humidity-saturated chamber.

Sandpaper abrasion tests on the zwitterionic coating were carried out in a wet environment using 150 grit SiC sandpaper as an abrasion surface. The sandpaper and samples were placed in aqueous solution for 5 minutes before abrasion to ensure the tests were conducted in a wet environment. After the samples were put face-down to the sandpaper (contact area = 1 × 1 cm^2), the samples were longitudinally and transversely abraded 10 cm along the ruler under a weight at 50 g successively, of which the process was defined as 1 cycle.

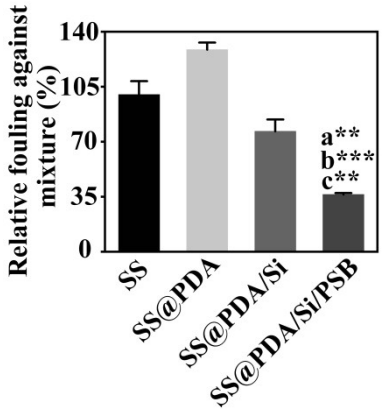

Figure S1. The protein adsorption assay of SS substrate with different surface modification (pristine SS, SS@PDA, SS@PDA/Si, SS@PDA/Si/PSB) using the mixture of BSA (2.0 mg/mL), Fg (0.3 mg/mL) and γ-GL (1 mg/mL). The result of SS@PDA, SS@PDA/Si, SS@PDA/Si/PSB was calculated in comparison with pristine SS. a = in comparison with SS, b = in comparison with SS@PDA, c = in comparison with SS@PDA/Si, The data were expressed as mean ± SD, n = 3. ($p^* < 0.05$, $p^{**} < 0.01$, $p^{***} < 0.001$).