

# Supplementary Materials: In situ Polymerization to Boron Nitride-Fluorinated Poly Methacrylate Composites as Thin but Robust Anti-Corrosion Coatings

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UV-vis spectrophotometry was recorded using a Shimadzu UV-2700 spectrometer. The settlement rate was evaluated by monitoring the absorbance at 400 nm, according to the following equation:

$$R = \frac{A_1 - A_2}{A_1} \times 100\% \quad (1)$$

Where  $R$  is the settlement rate,  $A_1$  and  $A_2$  are the absorbance values of the coating solution before and after sedimentation for 24 h, respectively.

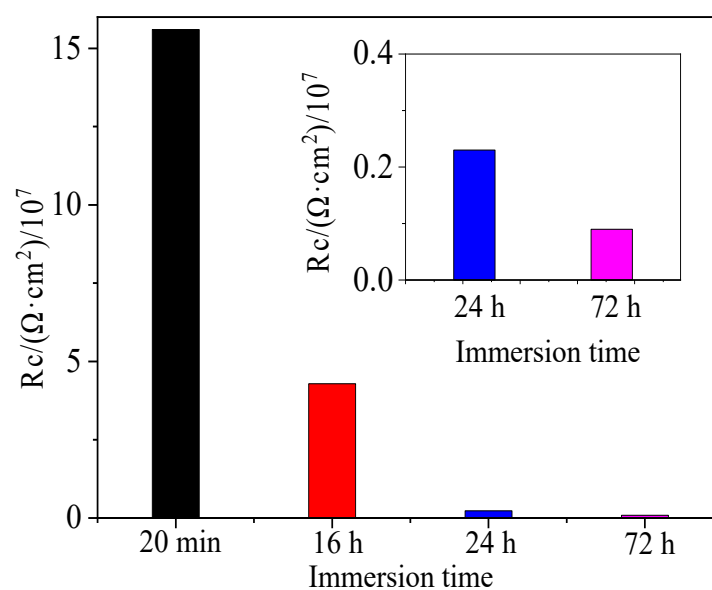
**Table S1.** Absorbance and calculated sedimentation rate of the coating solutions.

Coatings	1PFBP-1	1PFBP-2	1PFBP-3	2.5PFBP-2	5PFBP-2	BN/7200	BN570/PMA
$A_1$ <sup>(a)</sup>	0.277	0.474	0.537	0.917	1.574	0.053	0.330
$A_2$ <sup>(b)</sup>	0.247	0.444	0.536	0.888	1.562	0.008	0.275
$R\%$ <sup>(c)</sup>	10.8	6.3	0.2	3.16	0.76	84.9	16.7

(a) absorbance of the original coating solution; (b) absorbance of the coating solution after sedimentation for 24 h; (c) sedimentation rate calculated by the Equation (1).

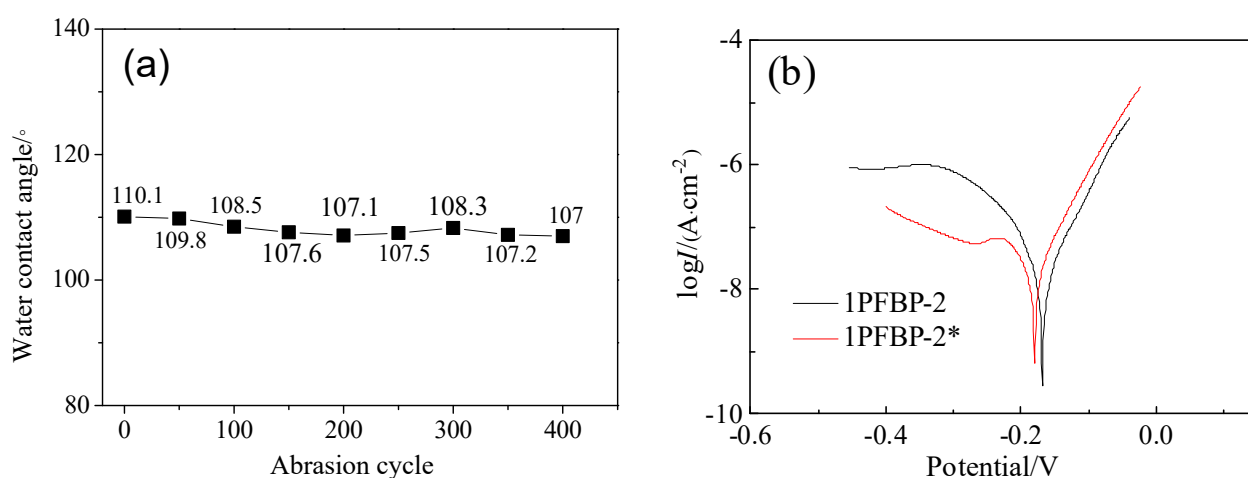
**Table S2.** EIS fitting parameters of 5PFBP-2 coatings in various immersion times.

Time	$R_f/(\Omega \cdot \text{cm}^2) \cdot 10^7$	$CPE_d/(\Omega^{-1} \cdot \text{cm}^2 \cdot \text{s})$	$R_{ct}/(\Omega \cdot \text{cm}^2) \cdot 10^7$	$CPE_{dl}/(\Omega^{-1} \cdot \text{cm}^2 \cdot \text{s})$
20 min	15.60	$1.55 \times 10^{-9}$	-	-
16 h	4.29	$6.64 \times 10^{-9}$	-	-
24 h	0.23	$9.02 \times 10^{-9}$	2.93	$2.77 \times 10^{-7}$
72 h	0.09	$9.97 \times 10^{-9}$	0.22	$9.03 \times 10^{-7}$



**Figure S1.** Pore resistance of the coating ( $R_c$ ) for the specimen coated with 5PFBP-2 coating at different immersion time in 3.5 wt.% NaCl solution.

It can be seen that the EIS data are well fitted by the models. The fitted data are collected in Table S2. After 72 h of immersion, the  $R_c$  of the coating decreased by near three orders of magnitude compared to the one immersed for 20 min (Figure S1), indicating that the electrolyte penetrates across the coating and corrodes the metal substrate.



**Figure S2.** Surface wettability (a) of 1PFBP-2 coating after numbers of friction and Tafel curves (b) of 1PFBP-2 coating after 400 cycles of abrasion.

**Table S3.** Electrochemical corrosion data from Tafel curves of 1PFBP-2 coating before and after friction for 400 cycles.

Sample	$I_{\text{corr}}/(\mu\text{A} \cdot \text{cm}^{-2})$	$E_{\text{corr}}/\text{mV}$	$R/10^{-4}(\text{mm} \cdot \text{year}^{-1})$
1PFBP-2	0.018	-168	2.10
1PFBP-2*	0.037	-180	4.33

Note:  $I_{\text{corr}}$ —corrosion current;  $E_{\text{corr}}$ —corrosion potential;  $R$ —corrosion rate; 1PFBP-2\*—1PFBP-2 coating after 400 cycles of abrasion.