

Supporting information for

New strategy for the design of anti-corrosion coatings in bipolar plates based on hybrid organic-inorganic layers

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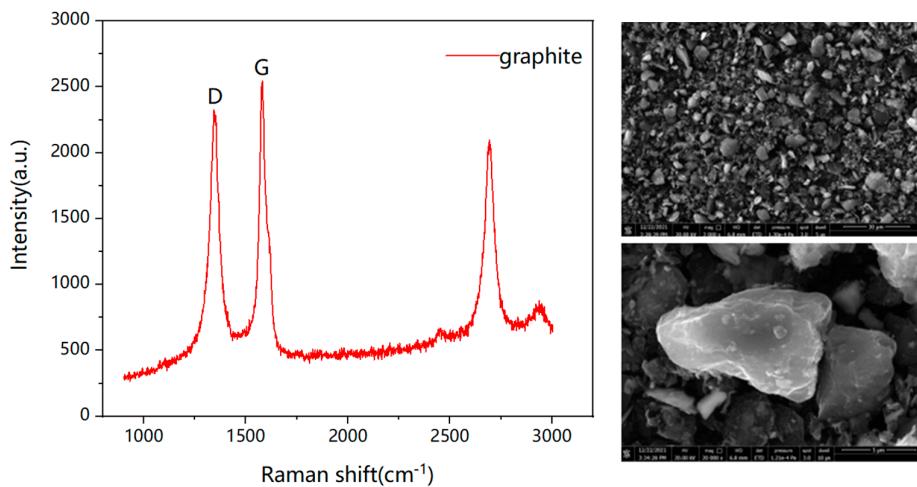


Fig. S1 Characterization of graphite powder: Raman Spectrum and SEM image of graphite powder

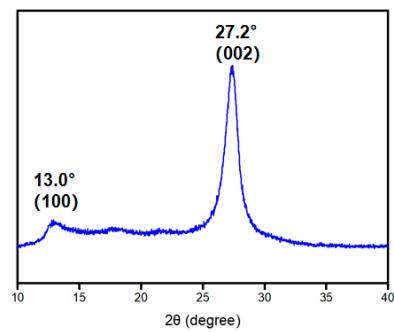


Fig. S2 X-ray diffraction (XRD) patterns of carbon nitride nanosheets

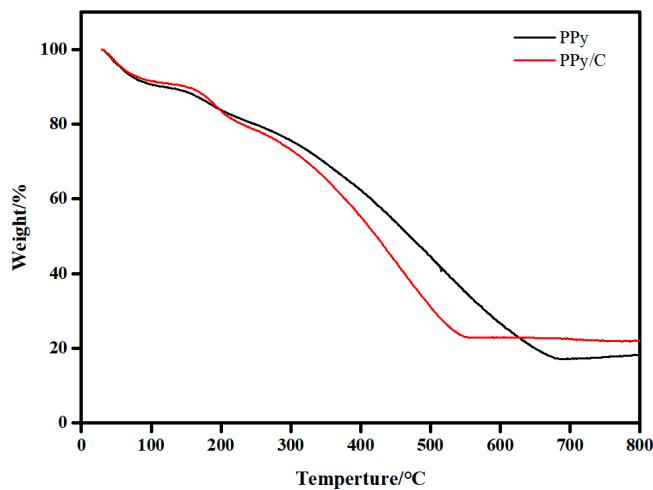


Fig. S3 TGA curve of (a) PPy, (b) PPy/C coatings under N₂ atmosphere.

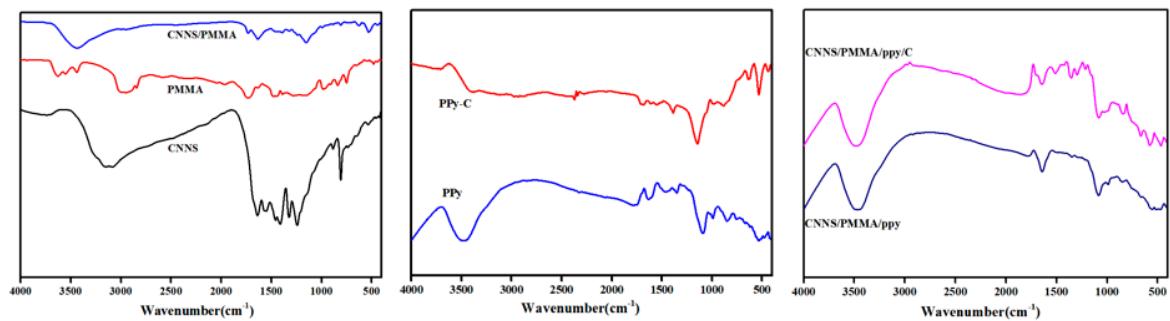


Fig. S4 FT-IR spectra of different coatings.

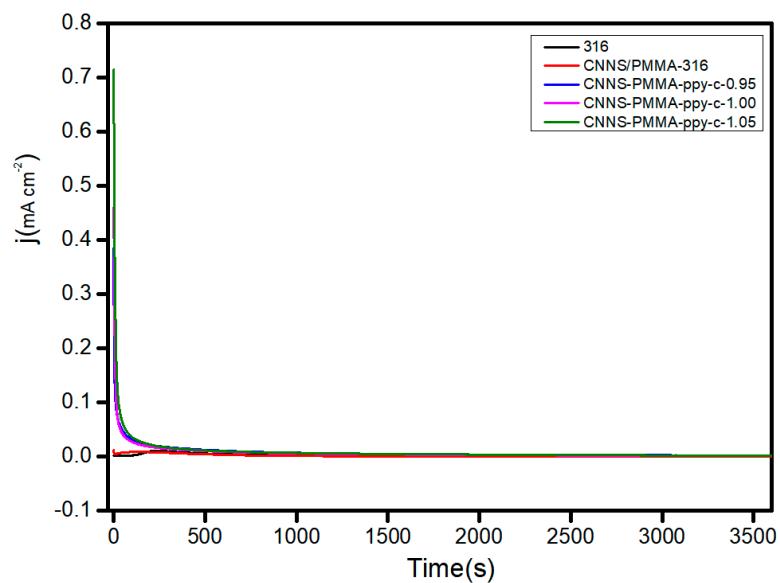


Fig. S5 Potentiostatic polarization curves for the bare 316SS and composite coatings in 0.1 M H₂SO₄+ 2 ppm HF at 70°C in 0.6V.

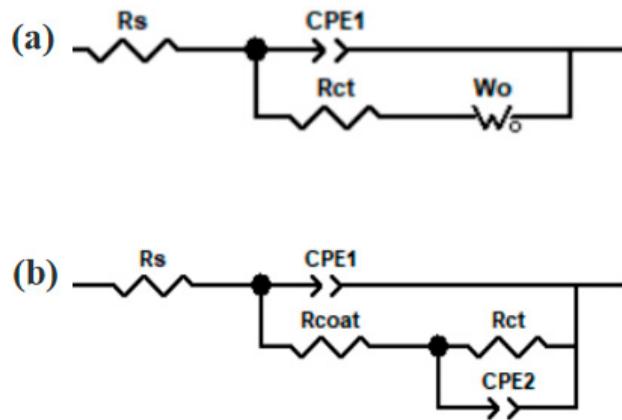


Fig. S6 Equivalent circuit for fitting the impedance diagram of (a)for bare 316SS and CNNS/PMMA-316, (b)for coated 316SS.

Table S1 The fitted electrochemical parameters of different samples

Samples	Rs (Ω·cm ²)	CPE		R _{coat} (Ω·cm ²)
		Y ₀ (Ω·cm ⁻² ·S ⁻ⁿ)	n	
316SS	6.372	2.134×10 ⁻⁵	0.749	5.532
CNNS/PMMA-316	5.051	1.364×10 ⁻³	0.667	4.384

Samples	Rs (Ω·cm ²)	CPE1			CPE2		
		Y ₀ (Ω·cm ⁻² ·S ⁻ⁿ)	n	R _{coat} (Ω·cm ²)	Y ₀ (Ω·cm ⁻² ·S ⁻ⁿ)	n	R _{ct} (Ω·cm ²)
				×10 ⁻⁴)			×10 ⁻⁵)
PPy-0.80	3.951	21.779	0.428	9.044	23.102	0.912	775.2
PPy-0.90	4.859	58.472	0.388	8.168	19.689	0.940	2068

PPy-1.00	4.576	16.145	0.638	5.937	17.777	0.928	1383
PPy-1.10	3.638	10.328	0.698	4.241	20.682	0.923	453.1
PPy/C-0.80	2.677	1.383	0.8822	3.606	18.129	0.922	2615
PPy/C-0.90	3.080	9.7728	0.689	3.987	22.693	0.928	907.4
PPy/C-1.00	4.372	17.951	0.673	6.824	19.518	0.921	2152
PPy/C-1.10	4.137	2.583	0.844	4.709	19.591	0.926	758.8
CNNS/PMMA/ PPy/C-0.95	5.955	18.069	0.5404	11.86	19.316	0.922	2468
CNNS/PMMA/ PPy/C-1.00	6.361	20.599	0.562	16.3	23.322	0.896	2802
CNNS/PMMA/ PPy/C-1.05	5.436	13.975	0.590	15.73	18.961	0.921	2188

Table S2 Interfacial contact resistance (ICR) values of different samples at a compaction force of 140 N/cm²

Sample	ICR (mΩ·cm ²)
316	66
PPy	51
PPy/C	22
CNNS/PMMA/PPy	115
CNNS/PMMA/PPy/C	86

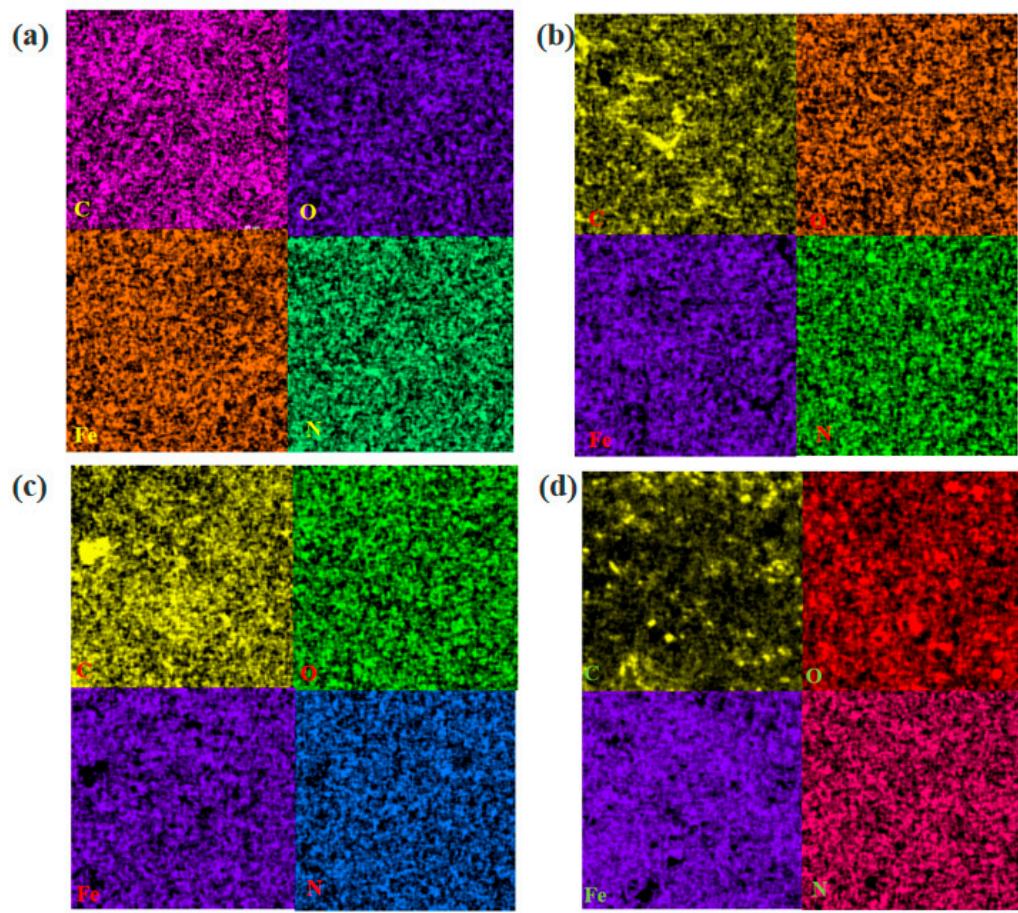


Fig. S7 EDX-mapping of (a)PPy, (b)PPy/C, (c)CNNS/PMMA/PPy,
(d)CNNS/PMMA/PPy/C