

Supporting Information

Enhancing the Corrosion Resistance of Waterborne Epoxy Coatings with Functionalized Biochar

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Results and discussion

Characterizations

The EDS spectra were employed to elucidate the distribution of carboxymethyl chitosan and the corrosion inhibitor on the carbon nanosheets (Fig. S1). C is the characteristic element of the carbon nanosheets, while N and O indicate the presence of carboxymethyl chitosan and the corrosion inhibitor. As depicted in the figure, the uniform distribution of C, O, and N elements across the PCNS confirms the successful functionalization of the PCNS surface with carboxymethyl chitosan and the corrosion inhibitor.

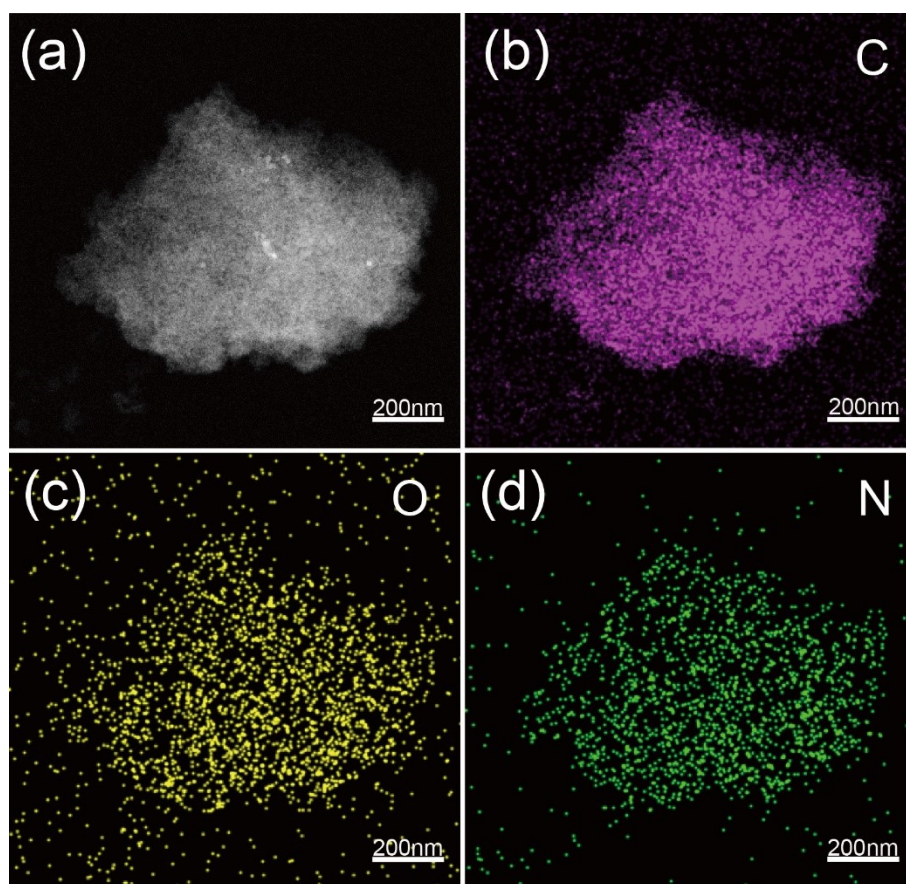


Fig. S1 The TEM-EDS mapping of PCNS@CMCS@8-HQ: (a)TEM image of PCNS@CMCS@8-HQ; (b) C, (c) O, (d) N distribution.

To further clarify the corrosion mechanism of the samples immersed in the solution, the measured EIS results were fitted using equivalent circuit data. Detailed information on the fitting parameters R_c , R_{ct} , CPE_c , and CPE_{dl} can be found in Table S1.

Table S1 Fitting results of EIS plots of the different coatings on metallic substrate after 60 days of immersion

coatings	time (day)	CPEc Y_0 ($\Omega^{-1} \text{ cm}^{-2}$ s^n)	n	Rc ($\Omega \text{ cm}^2$)	CPEdl Y_0 ($\Omega^{-1} \text{ cm}^{-2}$ s^n)	n	Rct ($\Omega \text{ cm}^2$)
WEP	0.5	3.2×10^{-10}	0.92	1.6×10^9	9.2×10^{-10}	0.51	2.7×10^9
	1	8.4×10^{-10}	0.83	1.1×10^9	1.2×10^{-9}	0.52	1.9×10^9
	5	9.8×10^{-10}	0.83	6.1×10^8	1.4×10^{-9}	0.55	7.9×10^8
	10	5.3×10^{-10}	0.94	4.1×10^8	1.1×10^{-9}	0.52	5.1×10^8
	30	1.2×10^{-9}	0.87	1.3×10^7			
	60	1.7×10^{-9}	0.84	6.0×10^6			
PCNS@C MCS	0.5	7.5×10^{-10}	0.84	2.0×10^9			
	1	6.5×10^{-10}	0.84	1.7×10^9			
	5	9.1×10^{-10}	0.83	8.9×10^8			
	10	3.9×10^{-10}	0.96	3.0×10^8			
	30	9.2×10^{-10}	0.86	5.2×10^7	2.1×10^{-8}	0.37	6.9×10^8
	60	1.0×10^{-9}	0.85	1.2×10^7	2.2×10^{-8}	0.53	3.8×10^7
PCNS@8- HQ	0.5	8.1×10^{-10}	0.82	1.7×10^9			
	1	9.4×10^{-10}	0.84	8.7×10^8			
	5	9.8×10^{-10}	0.83	6.2×10^8			
	10	3.2×10^{-10}	0.93	1.7×10^9			
	30	9.1×10^{-10}	0.93	2.1×10^9	6.3	0.96	2.2×10^9
	60	1.4×10^{-9}	0.77	1.4×10^8	2×10^{-8}	0.74	1.4×10^8
PCNS@C MCS@8- HQ	0.5	9.6×10^{-10}	0.76	4.3×10^9			
	1	9.5×10^{-10}	0.78	3.9×10^9			
	5	5.1×10^{-10}	0.89	1.7×10^9			
	10	8.2×10^{-10}	0.86	6.9×10^9			
	30	5.8×10^{-10}	0.85	2.4×10^9			
	60	8.1×10^{-10}	0.86	1.7×10^9			