

Tailored cerium phosphate/silica hybrid epoxy for enhanced corrosion protective coating

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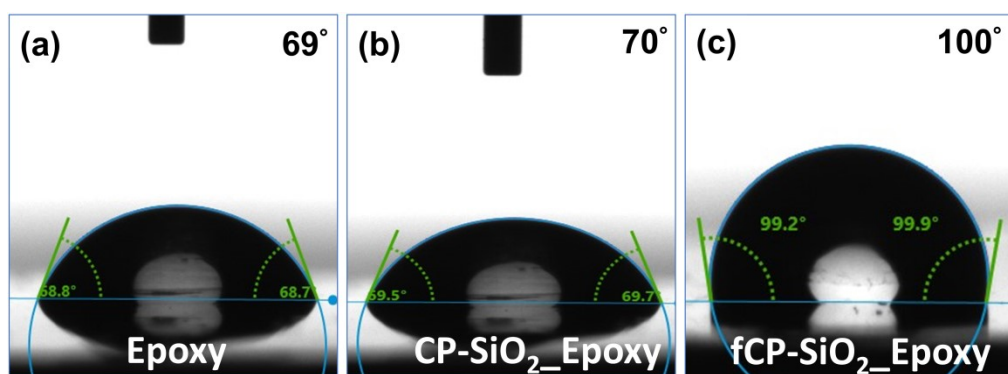


Fig. S1 Contact angle of (a) epoxy, (b) CP-SiO₂-epoxy and (c) fCP-SiO₂-epoxy coat.

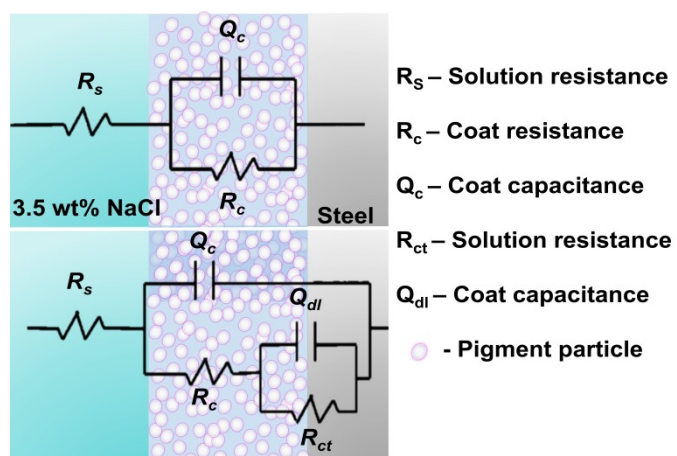


Fig. S2 Schematic representation of circuit element in the coat.

Table S1. The BET analysis results of SiO₂ and CP-SiO₂

BET data	SiO ₂	CP-SiO ₂
Single point surface area at P/Po = 0.273853	144.70 m ² /g	128.40 m ² /g
BET surface area	148.46 m ² /g	130.53 m ² /g
BJH Desorption cumulative surface area of pores between 1.7 nm and 30 nm diameter	124.71 m ² /g	113.31 m ² /g
BJH Desorption average pore diameter (4V/A)	38.171 nm	38.205 nm

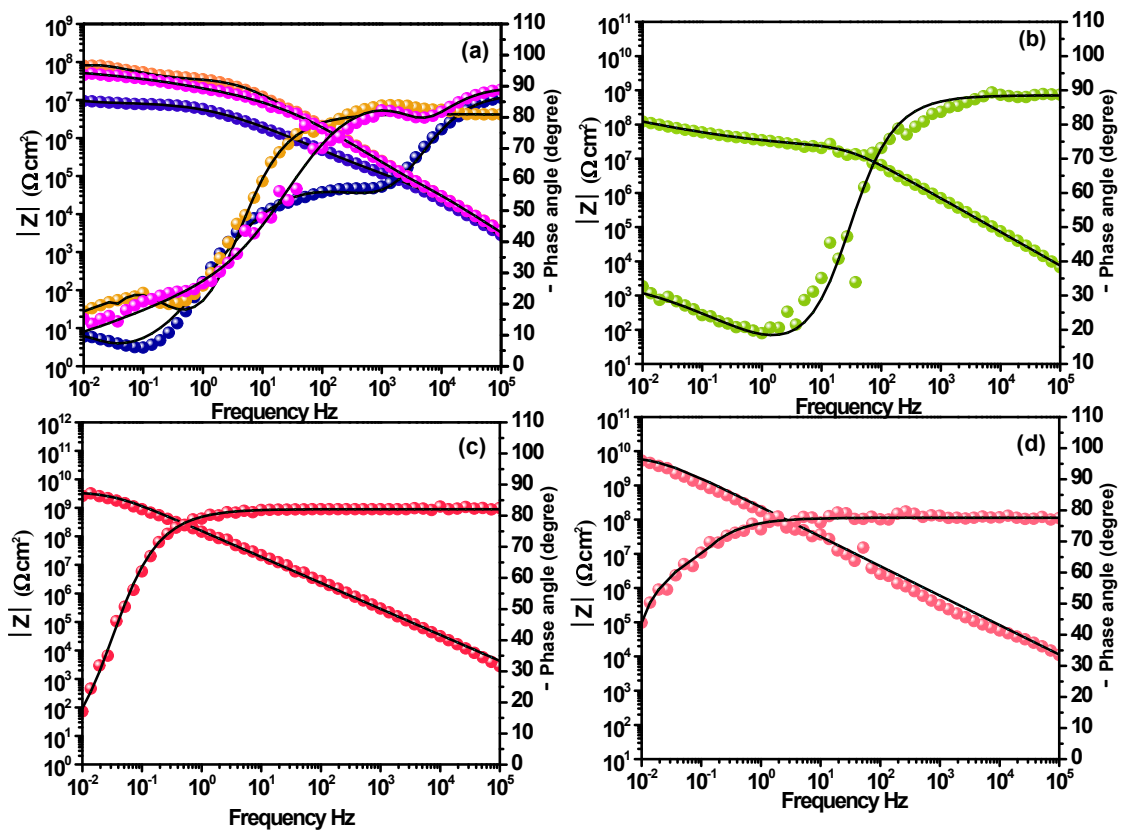


Fig. S3 Bode plots of **(a)** silica loaded (5,10 and 15 wt%) epoxy coatings, **(b)** 10 wt% of P-SiO₂ epoxy, **(c)** CP-SiO₂ epoxy and **(d)** fCP-SiO₂ epoxy coating.

Table S2- EIS parameters of fCP-SiO₂ with and without artificial defect.

fCP-SiO ₂	Duration	R _c (Ω cm ²)	Q _c		R _{ct} (Ω cm ²)	Q _{dl}	
			Y _o (Ω ⁻¹ cm ⁻² S ⁿ)	n ₁		Y _o (Ω ⁻¹ cm ⁻² S ⁿ)	n ₂
Without artificial defect	1 day	9.91×10 ⁹	5.33×10 ⁻⁹	0.7			
	7 days	5.67×10 ⁸	2.21×10 ⁻⁹	0.85			
	15 days	2.37 ×10 ⁸	2.88×10 ⁻⁹	0.8			
	30 days	8.65×10 ⁷	4.75×10 ⁻⁹	0.7			
	45 days	2.06×10 ⁶	1.26×10 ⁻⁶	0.7	5.09×10 ⁶	9.61×10 ⁻⁹	0.7
	60 days	1.32×10 ⁶	2.54×10 ⁻⁶	0.7	1.41×10 ⁷	8.88×10 ⁻⁹	0.8
With artificial defect	10 min	1.11×10 ⁵	1.64×10 ⁻⁶	0.8	1.58×10 ⁵	7.86×10 ⁻⁷	0.9
	2 h	3.11×10 ⁵	3.14×10 ⁻⁸	0.8	3.63×10 ⁵	7.00×10 ⁻⁸	0.9
	4 h	3.26×10 ⁵	1.71×10 ⁻⁷	0.9	5.78×10 ⁵	4.74×10 ⁻⁸	0.6
	6 h	9.62×10 ⁶	1.09×10 ⁻⁷	0.9	7.24×10 ⁹	6.52×10 ⁻⁸	0.6
	8 h	7.20×10 ⁶	1.05×10 ⁻⁷	0.9	2.88×10 ⁸	6.67×10 ⁻⁸	0.6
	24 h	8.35×10 ⁶	1.09×10 ⁻⁷	0.9	1.09×10 ⁸	4.96×10 ⁻⁸	0.6
	345 h	3.98×10 ⁵	5.62×10 ⁻⁷	0.9	1.79×10 ⁶	7.09×10 ⁻⁸	0.6

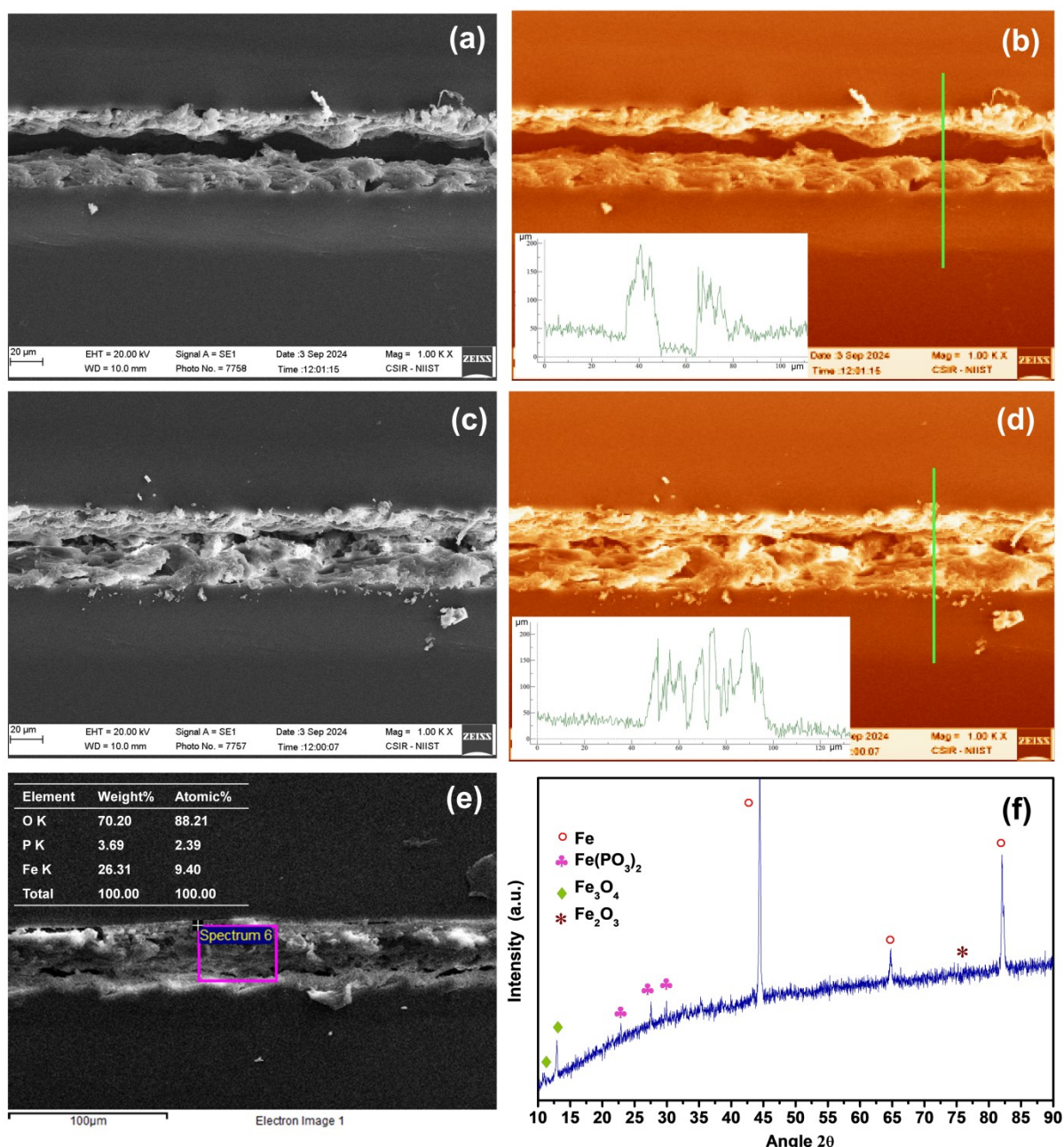


Fig. S4 (a) SEM image, (b) profile image of artificially defective fCP-SiO₂ epoxy coat, (c) SEM image, (d) profile image, (e) SEM-EDX analysis and (f) XRD analysis of artificially defective fCP-SiO₂ epoxy coat after immersing in saline solution.

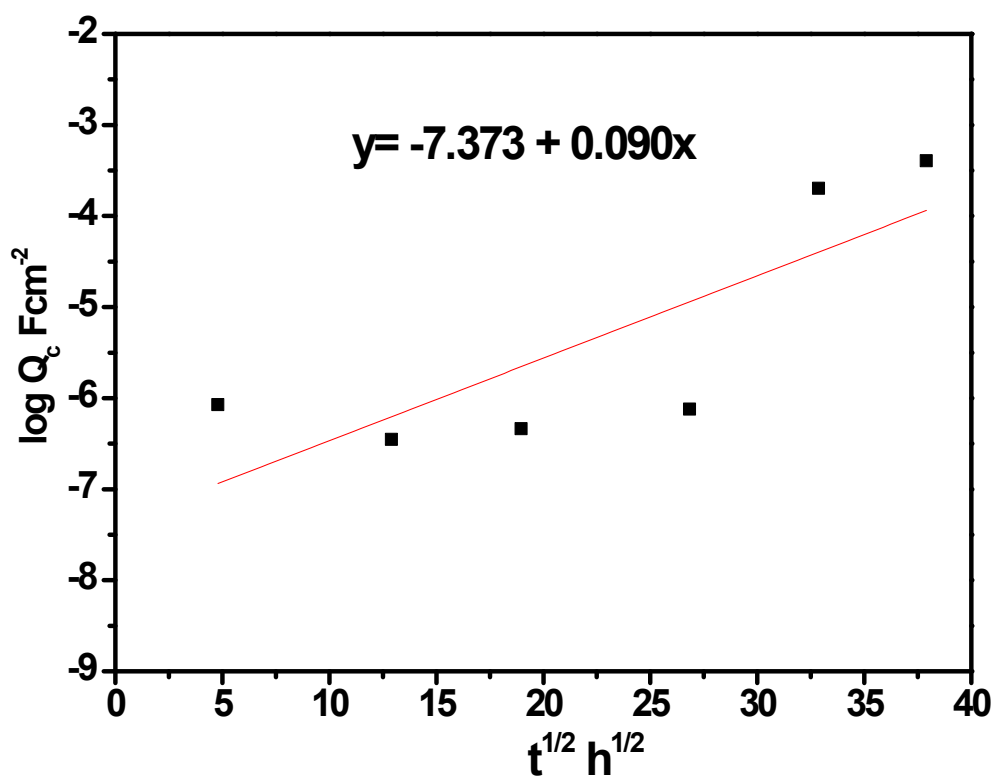


Fig. S5 $\log Q_c - t^{1/2}$ curves of fCP-SiO₂/epoxy coating immersed in 3.5% NaCl solution.