Supporting Information

Efficient corrosion inhibition of sugarcane purple rind extract for carbon steel in HCl solution: Mechanism analyses by experimental and *in-silico* insights

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Table S1 Nominal chemical components of Q235 steel

Item	C	Mn	Si	S	P	Fe
Content (%)	0.22	1.4	0.35	0.05	0.045	Balance

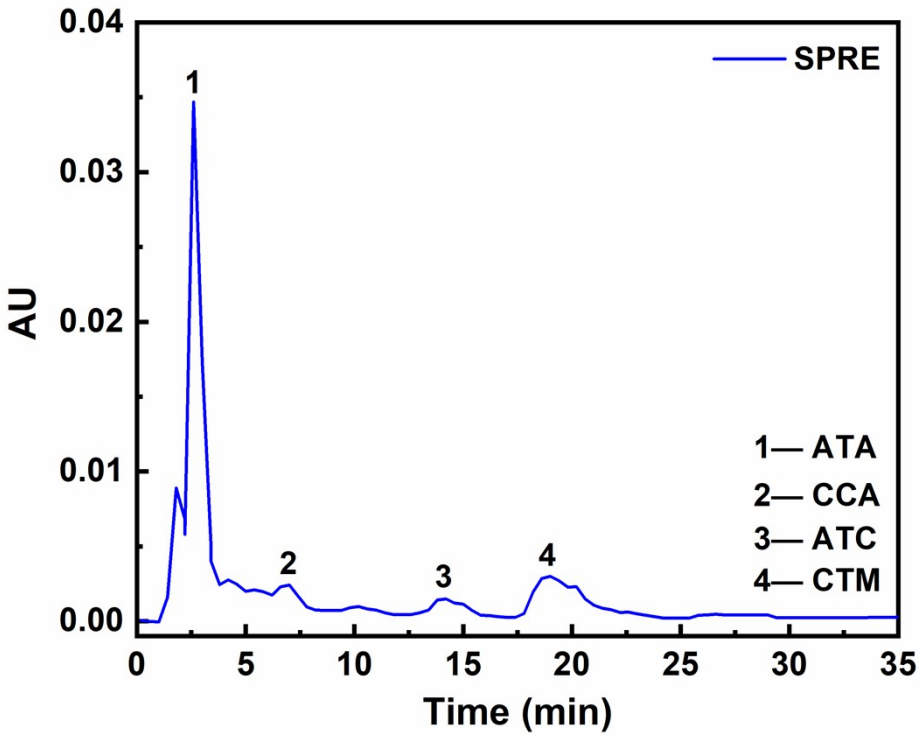

Fig. S1 HPLC chromatogram of SPRE: specific compound is identified by the standard substance

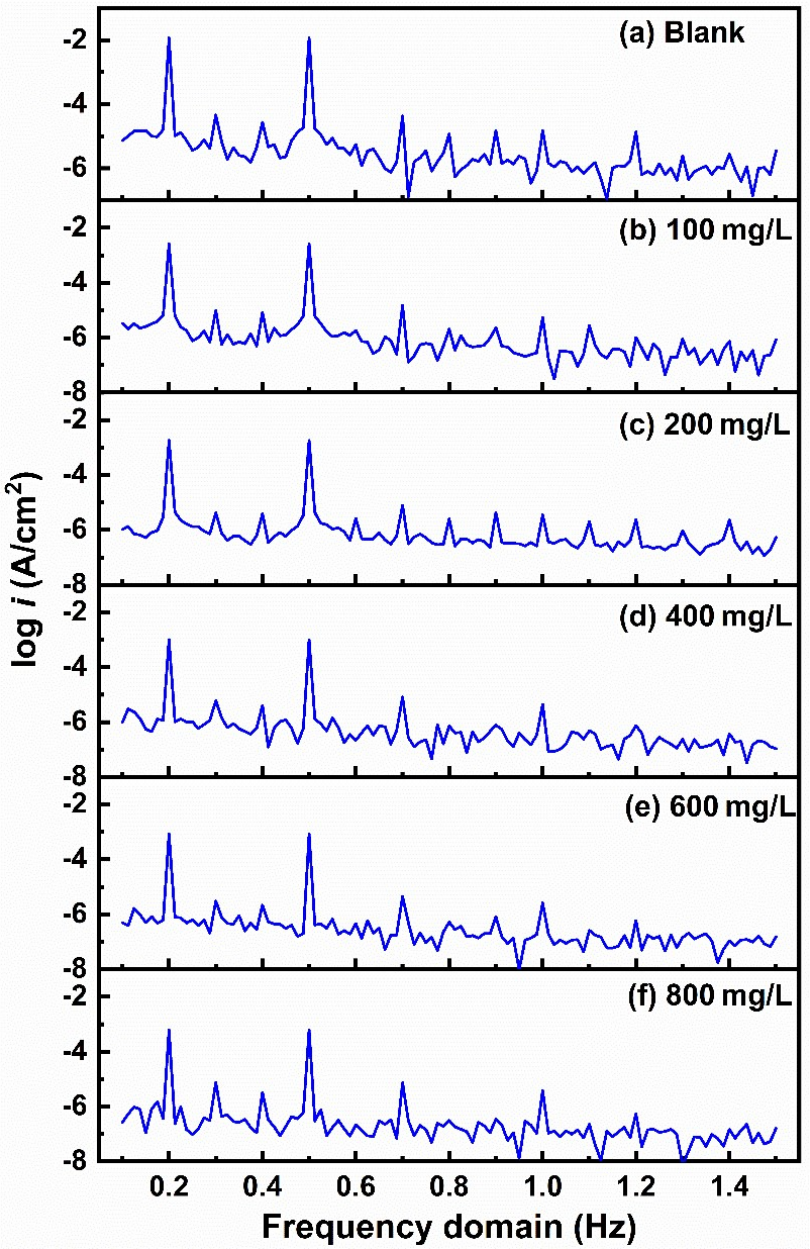

Fig. S2 Electrochemical frequency modulation spectra of C-steel in 1 M HCl solution without and with different concentrations of SPRE

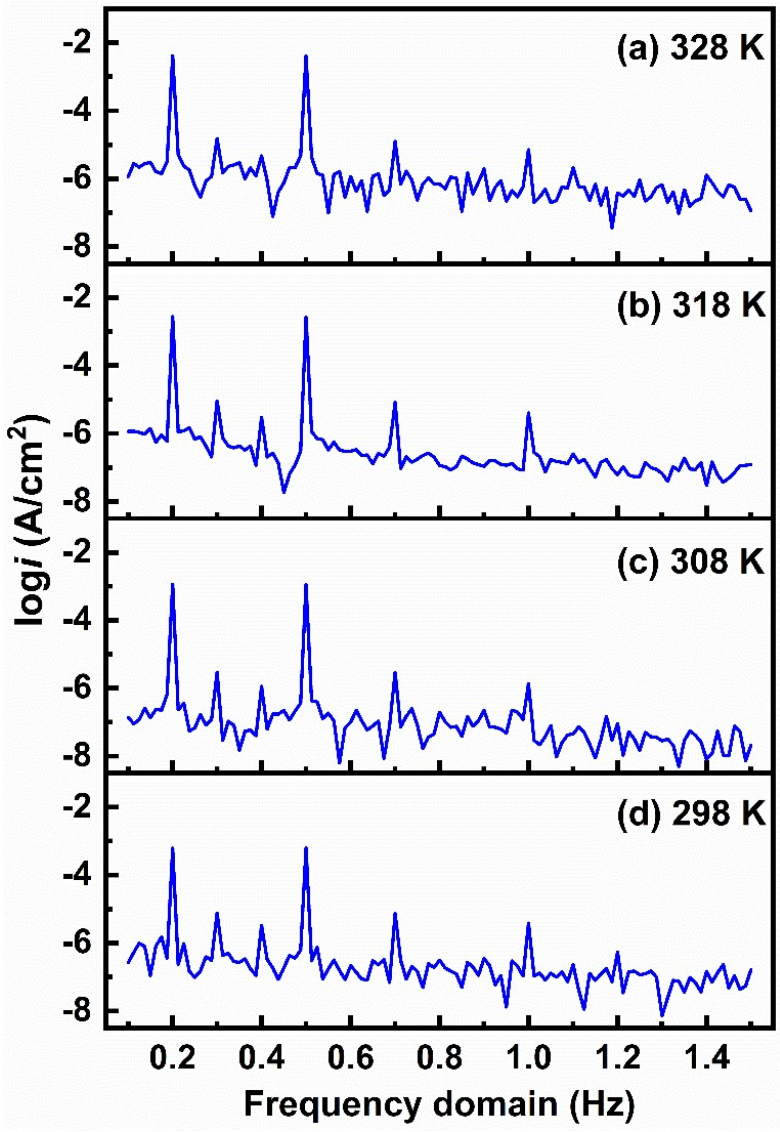

Fig. S3 Electrochemical frequency modulation spectra of C-steel in 1 M HCl solution with 800 mg/L SPRE at pre-set temperatures

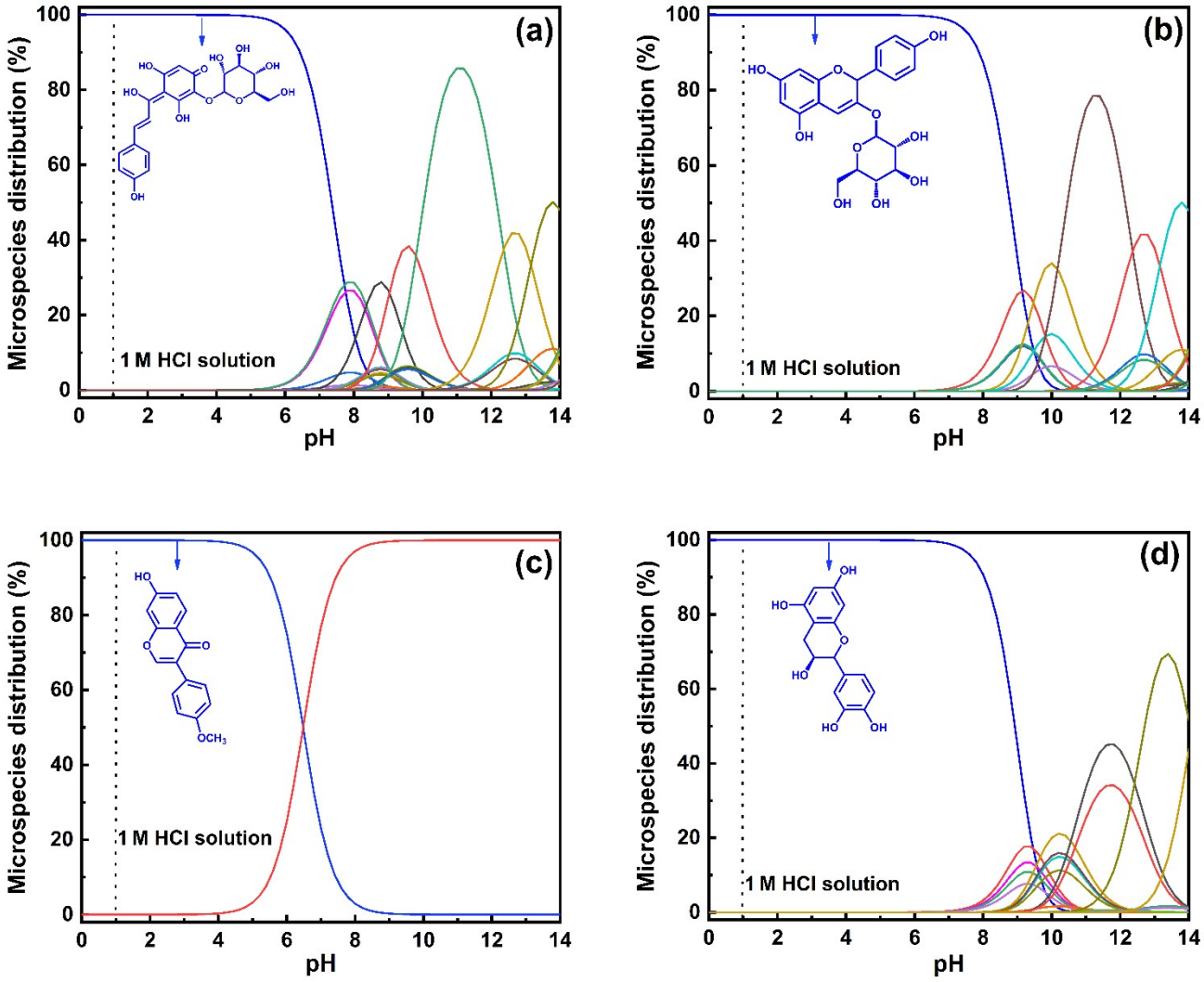

Fig. S4 Microspecies analyses of carthamin (a), anthocyanin (b), anthocyanin (c) and catechinic acid (d) at a full range of pH values

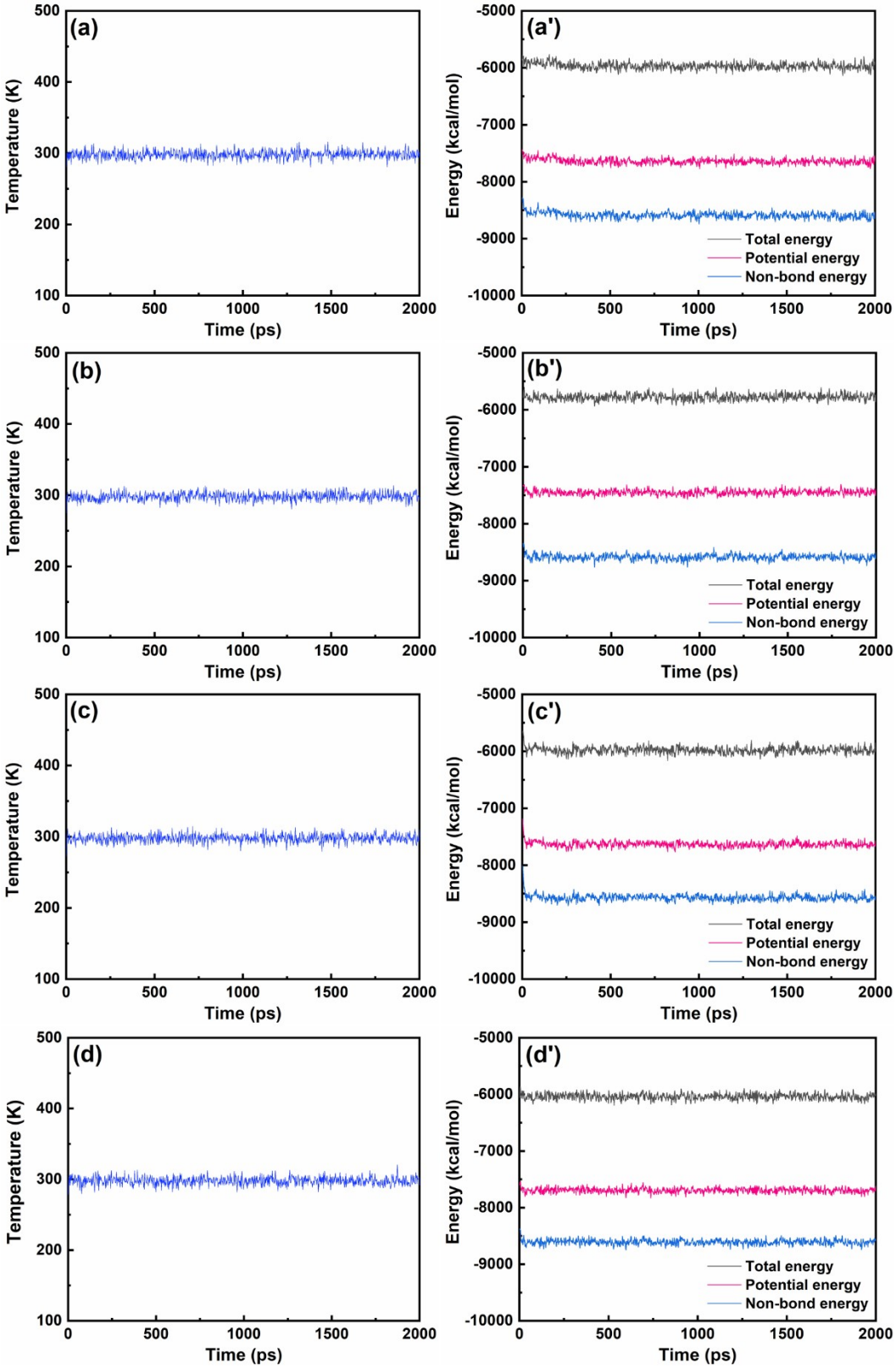

Fig. S5 Equilibrium of temperature (left) and energies (right) for the adsorption process of carthamin (a and a'), anthocyanin (b and b'), anthoxanthin (c and c') and catechinic acid (d and d') on Fe (1 1 0)

Table S2 Comparison of anticorrosion capability of typical polyphenol-/flavonoids-based plant extract for C-steel in acidic media reported in recent years

Plant extract/Ref.	Component type	Medium	Maximum η_w (%)
Ficus tikoua leave [R1]	Polyphenols/flavonoids	1 M HCl	95.8% at 298 K
Tamarix aphylla bark [R2]	Polyphenols	Acidic seawater	85.0% at 298 K
Rhoeo discolor leave [R3]	Flavonoids	0.5 M HCl	85.3% at 303 K
Hymenaea stigonocarpa [R4]	Polyphenols/flavonoids	0.5 M H_2SO_4	90% at 298 K
Ruta chalepensis [R5]	Flavonoids	1 M HCl	80.65% at 298 K
Gentiana olivieri [R6]	Polyphenols	0.5 M HCl	93.7% at 298 K
Aerva lanata flower [R7]	Polyphenols/flavonoids	1 M HCl	88% at 298 K
Cannabis sativa leave [R8]	Polyphenols	0.5 M H_2SO_4	97.31% at 298 K
Arbutus unedo L. leave [R9]	Polyphenols/flavonoids	1 M HCl	91.72% at 298 K
Walnut green husk [R10]	Flavonoids	3 M H_3PO_4	73.4% at 298 K
Cryptocarya nigra [R11]	Polyphenols	1 M HCl	91.05% at 298 K
Acacia nilotica leave/stem [R12]	Polyphenols	0.5 M H_2SO_4	89% at 298 K
SPRE in this study	Polyphenols/flavonoids	1 M HCl	94.7% at 298 K

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