SUPPORTING INFORMATION

Controllable synthesis of layered double hydroxide nanosheets to build organic inhibitor-loaded nanocontainers for enhanced corrosion protection of carbon steel

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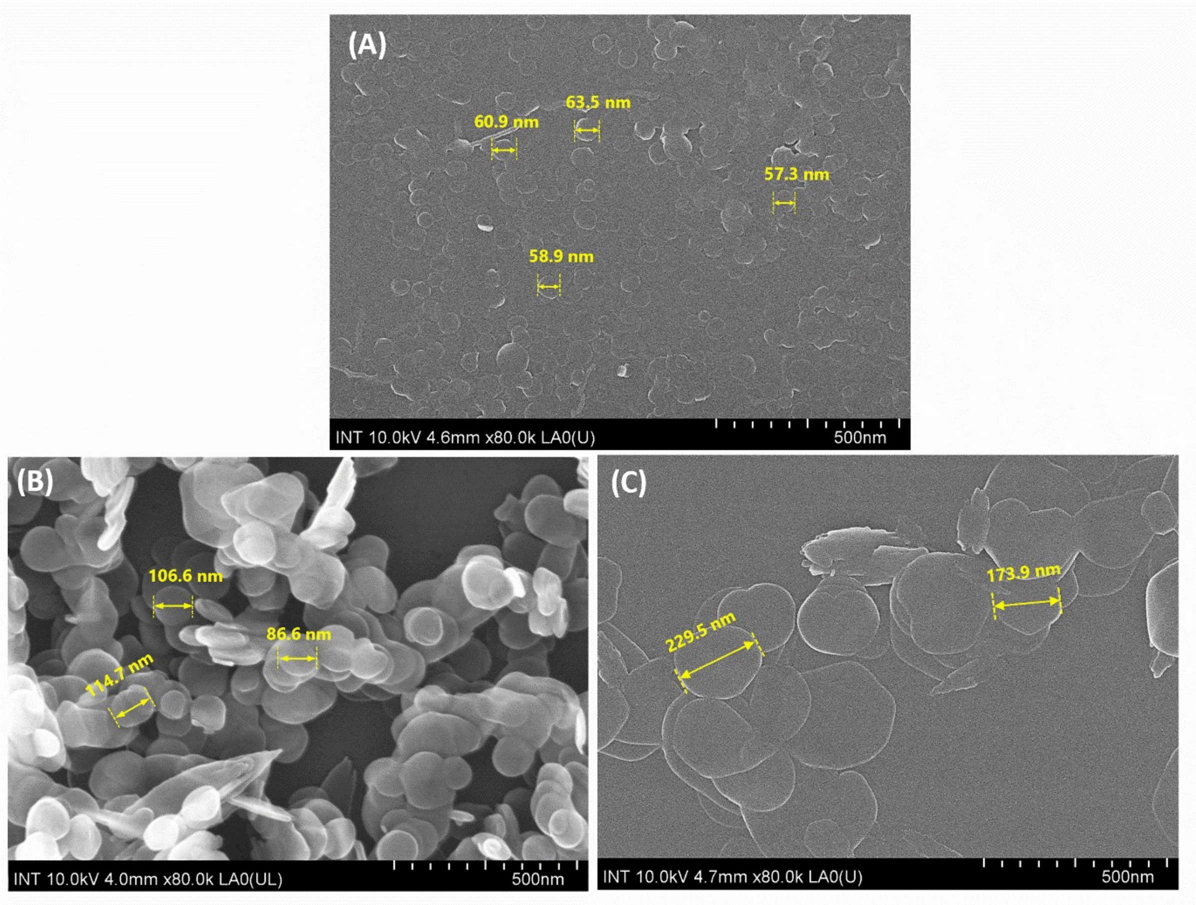

Figure S1. FE-SEM image of LDH-Cl samples hydrothermally treated at 80 ^{o}C (A), 100 ^{o}C (B) and 150 ^{o}C (C)

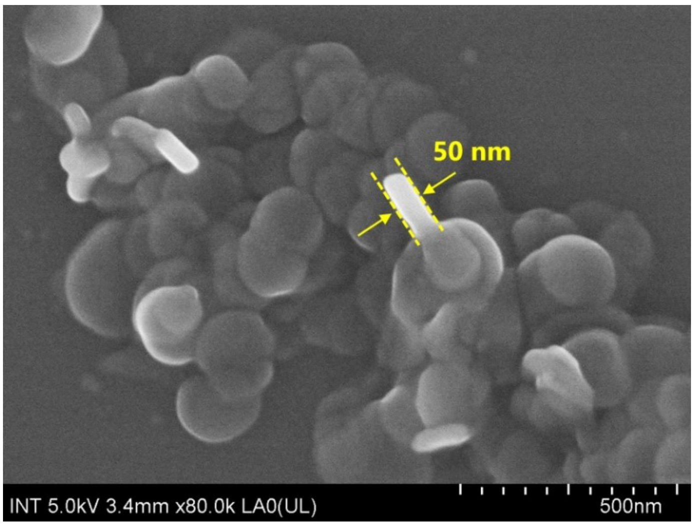

Figure S2. FE-SEM image of prepared LDH-Cl-F hydrothermal treatment at 125 ^{o}C

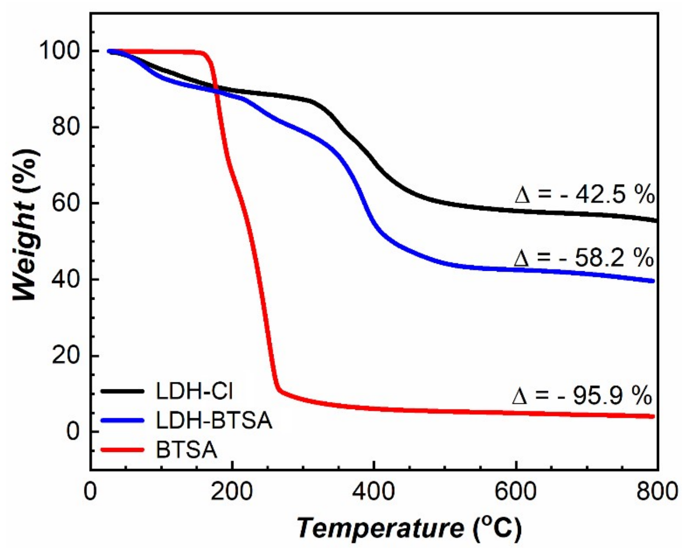

Figure S3. TGA variation curves of BTSA, LDH-Cl and LDH-BTSA

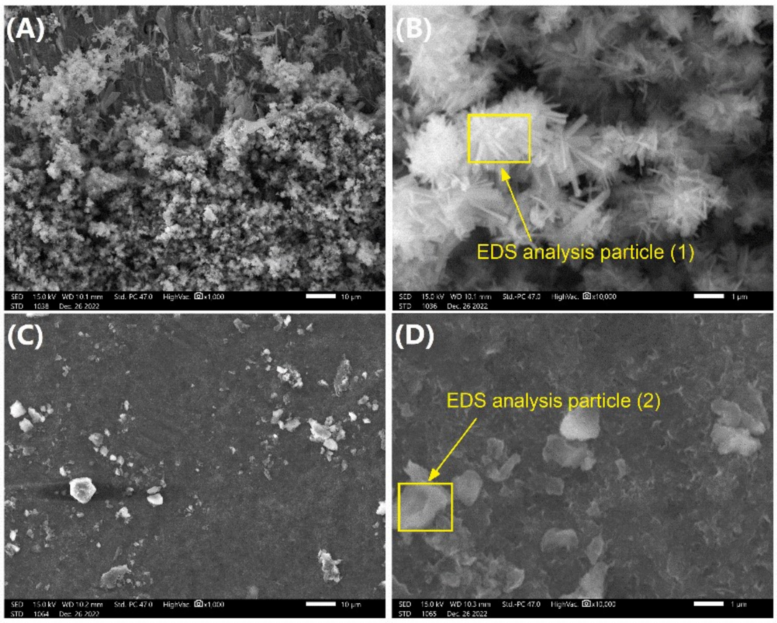

Figure S4. SEM image of steel electrode surface after 24 hours immersion in 0.1 M NaCl solution without inhibitor (A, B) and with 3 g/L of LDH-BTSA (C, D).

Table S1. The zeta potential and hydrodynamic size of the prepared LDH-Cl under various hydrothermal treatment temperatures.

Samples	Hydrothermal temperature (^oC)	Zeta potential (mV)	Z-average (nm)	PI value
LDH-Cl-80	80	+61.7	77.4	0.171
LDH-Cl-100	100	+72.1	115.4	0.195
LDH-Cl-125	125	+73.9	168.4	0.180
LDH-Cl-150	150	+75.6	212.5	0.131

Table S2. Basal spacing and lattice parameters of LDH crystallites.

Samples	LDH-Cl					LDH-BTSA				
	2 θ (°)	θ (radians)	d (nm)	Lattice parameters (nm)		2 θ (°)	θ (radians)	d (nm)	Lattice parameters (nm)	
				a	c				a	c
(003)	11.279	0.098	0.7839	0.3058	2.3531	5.372	0.047	1.6438	0.3038	4.8258
(006)	22.643	0.198	0.3924			11.238	0.098	0.7867		
(110)	60.509	0.528	0.1529			60.951	0.532	0.1519		

The 2θ positions of the peak in the XRD pattern are used to calculate the basal spacing (d_{003}) and lattice parameters of LDH. The interlayer spacing was determined using Bragg's law: $d = \lambda/2\sin\theta$. Here, λ is the X-ray wavelength (λ = 1.5418 nm), and θ is the *(003)* diffraction angle. Lattice parameters *a* and *c* represent the metal-metal cation distances in the lamellar layer and unit cell thickness of LDH, respectively, were calculated using the 2θ angle position of *(003), (006) and (110)* diffraction peaks: $a = 2d_{(110)}$ and $c = 3/2[d_{(003)} + 2d_{(006)}]$ [1,2].

[1] Vieira, D.; Sokol, D.; Smalenskaite, A.; Kareiva, A.; Ferreira, M.; Vieira, J.; Salak, A. Cast iron corrosion protection with chemically modified MgAl layered double hydroxides synthesized using a novel approach. *Surf. Coat. Technol.* **2019,** *375*, 158-163.

[2] Zhao, Y.; Li, F.; Zhang, R.; Evans, D. G.; Duan, X. Preparation of layered double-hydroxide nanomaterials with a uniform crystallite size using a new method involving separate nucleation and aging steps. *Chem. Mater.* **2002,** *14* (10), 4286-4291.

Table S3. The Tafel parameters from the polarization curves of steel electrodes in 0.1 M NaCl solution with and without inhibitors after 2 h of immersion.

Samples	E_{corr} (mV)	i_{corr} ($\mu A.cm^{-2}$)	β_a ($mVdec^{-1}$)	$-\beta_c$ ($mVdec^{-1}$)	η_i *(%)*
Blank	-613.589	19.202	102.4	885.4	-
BTSA	-335.079	0.598	178.4	112.0	96.9
LDH-Cl	-555.169	12.987	114.4	820.3	32.4
LDH-BTSA	-439.462	1.866	202.2	143.1	90.3

Where E_{corr}, i_{corr}, β_a, β_c, η_i *are* corrosion potential, corrosion current density, Tafel slope of anodic, cathodic, and inhibition efficiency, respectively. The inhibitor efficiency was determined by the equation: η_i = 100% x (i^o- i^n)/ i^o; where i^n and i^o is the corrosion density of the electrode exposed in NaCl with and without the inhibitor.

Table S4. Fitting parameters from the EIS diagram of mild steel electrode immersed in NaCl 0.1 M solution with and without inhibitors at diferrent immersion time

Samples	Time (h)	R_s (Ω.cm^2)	R_p (Ω.cm^2)	Q_{dl} (mFs$^{(n-1)}$. cm^{-2})	n_{dl}	R_f (Ω.cm^2)	Q_f (mFs$^{(n-1)}$. cm^{-2})	n_f
Blank	2	27.3	1300	1.287	0.68	-	-	-
	4	33.3	1224	2.066	0.65	-	-	-
	8	33.8	1078	2.119	0.65	-	-	-
	24	34.5	1059	2.506	0.62	-	-	-
LDH-Cl	2	26.8	1571	0.559	0.73	-	-	-
	4	32.6	1776	1.125	0.77	-	-	-
	8	30.4	1501	1.382	0.70	-	-	-
	24	30.7	1440	2.042	0.75	-	-	-
BTSA	2	29.2	14190	0.132	0.42	3457	0.184	0.77
	4	29.1	9979	0.281	0.54	2660	0.286	0.72
	8	28.9	4935	0.521	0.58	266.2	0.836	0.62
	24	28.2	2409	1.216	0.66	94.3	1.195	0.59
LDH-BTSA	2	29.1	6905	0.136	0.78	2746	2.778	0.88
	4	29.4	9703	0.111	0.79	1406	1.601	0.73
	8	29.8	11271	0.093	0.80	1261	0.776	0.81
	24	30.6	3270	0.221	0.86	135.8	0.331	0.73

Where R_s, $R_{p,}$ and R_f represented solution resistance, polarization resistance, and film resistance, respectively. CPE_{dl} and CPE_f are constant phase elements of the double layer and film, Q, and n values are parameters of CPE.