Electronic Supplementary Material (ESI) for Dalton Transactions

Facile assembly for fast construction of intercalation hybrids of layered double hydroxides with anionic metalloporphyrin

Juanjuan Ma,[a] Lin Liu,[a] Shanzhong Li,[a] Meng Zhuo,[a] Feng Shao,[a,b] Junyan Gong[a] and Zhiwei Tong*[ac]

[a] *Department of Chemical Engineering, Huaihai Institute of Technology, Lianyungang 222005, P.R. China*
[b] *School of Chemical Engineering, China University of Mining and Technology, Xuzhou, 221116, P.R. China*
[c] *SORST, Japan Science and Technology (JST)*

Chemical composition of LDHs and MnTSPP/LDH nanocomposites:

(1) Mg-Al-CO_3 LDH

Chemical analysis (C, H, N): C, 2.58; H, 4.11. Metal analysis indicated Mg/Al molar ratios of 1.94. The water content measured by TGA was equal to 1.9 H_2O molecules per Al^{3+} cation.

(2) Ni-Al-CO_3 LDH

Chemical analysis (C, H, N): C, 1.84; H, 3.06. Metal analysis indicated Ni/Al molar ratios of 2.13. The water content measured by TGA was equal to 1.8 H_2O molecules per Al^{3+} cation.

(3) MnTSPP/Mg-Al $LDH_{2.0}$

The following data were found from chemical analysis (C, H, N): C 22.05, H 4.47, N 3.28. Metal analysis indicated Mg/Al and Mn/Al molar ratios of 1.17 and 0.13, respectively. The water content measured by TGA was equal to 3.1 H_2O molecules per Al^{3+} cation. The intercalated material contains 389 μmol of MnTSPP per gram of material.

(4) MnTSPP/Ni-Al $LDH_{1.0}$

The following data were found from chemical analysis (C, H, N): C 19.68, H 3.79, N 2.56. Metal analysis indicated Ni/Al and Mn/Al molar ratios of 1.21 and 0.13, respectively. The water content measured by TGA was equal to 2.4 H_2O molecules per Al^{3+} cation. The intercalated material contains 360 μmol of MnTSPP per gram of material.

Table S1 Properties of the pristine LDH samples

Properties	Mg-Al-CO_3 LDH	Ni-Al-CO_3 LDH
Chemical formula	$[Mg_{0.66}Al_{0.34}(OH)_2](CO_3)_{0.17}\cdot 0.63H_2O$	$[Ni_{0.68}Al_{0.32}(OH)_2](CO_3)_{0.16}\cdot 0.57H_2O$
d_{110}, Å	1.524	1.517
Unit cell a,[a] Å	3.048	3.034
Layer unit area,[b] Å^2	8.046	7.972
Layer charge density, e^+/Å^2	0.0423	0.0401
Equivalent area, Å^2/charge	23.6	24.9

[a] $a = 2d_{110}$.

[b] Area of a $M^{II}_{1-x}Al_x(OH)_2$ octahedral unit = $a^2 \sin 60^o$.

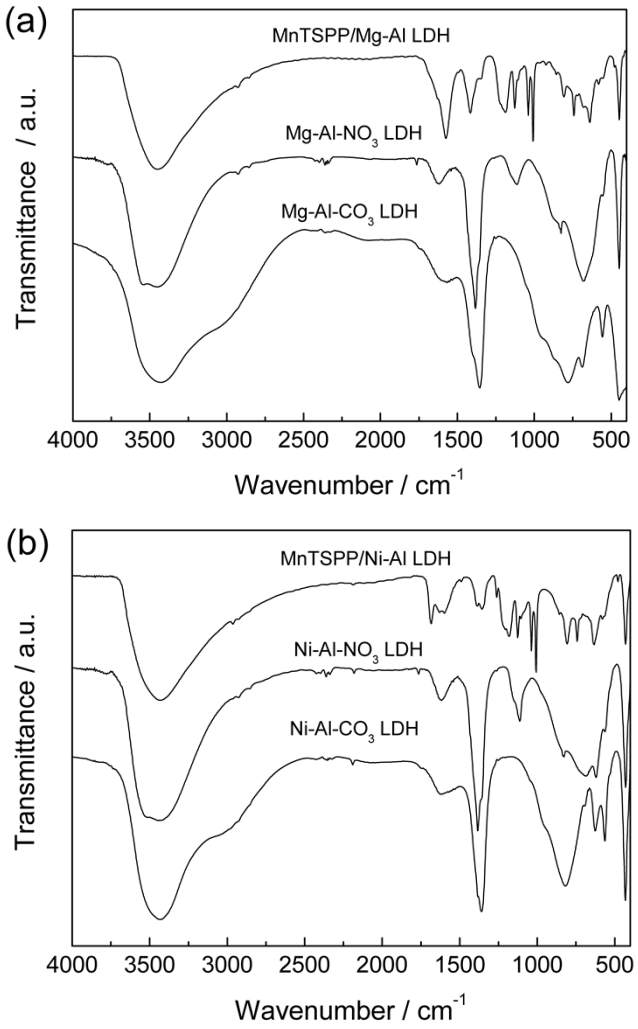


Fig. S1 FT-IR spectra of carbonated, nitrated and metalloporphyrin intercalated LDH samples: (a) Mg-Al LDHs, (b) Ni-Al LDHs

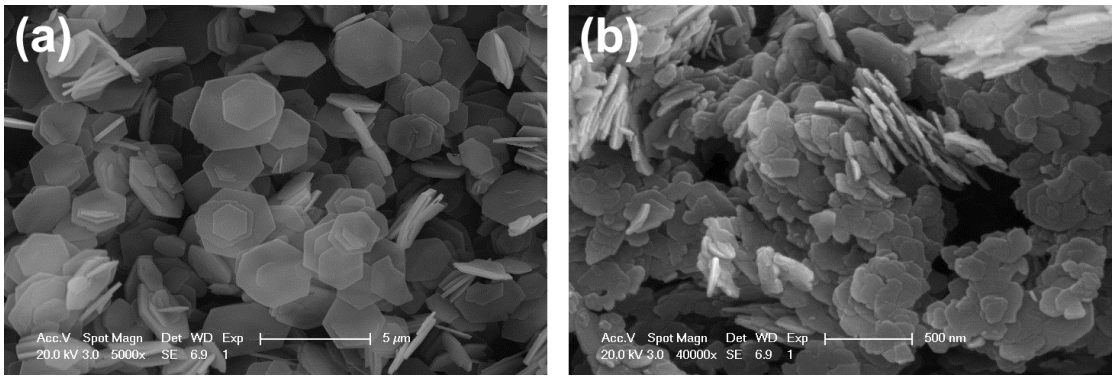
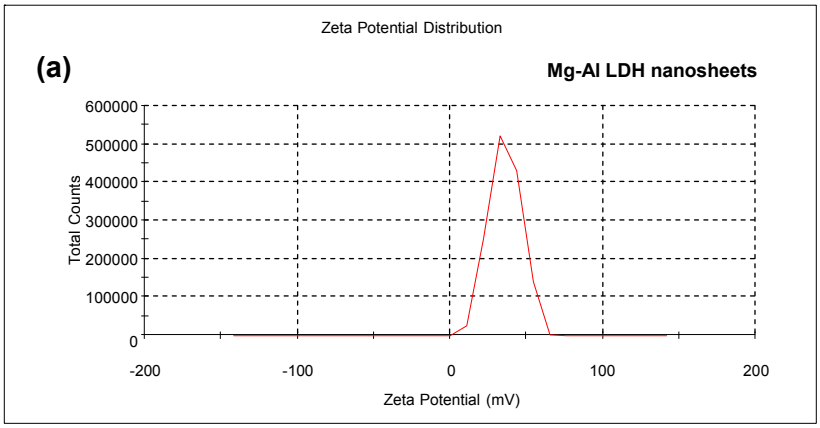
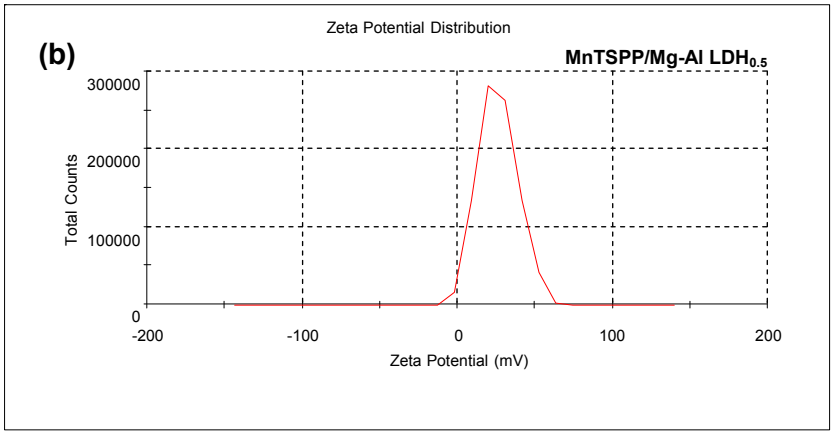
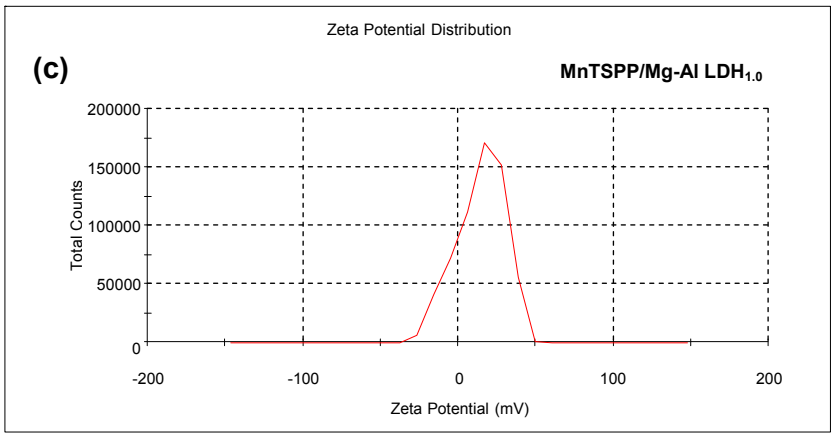
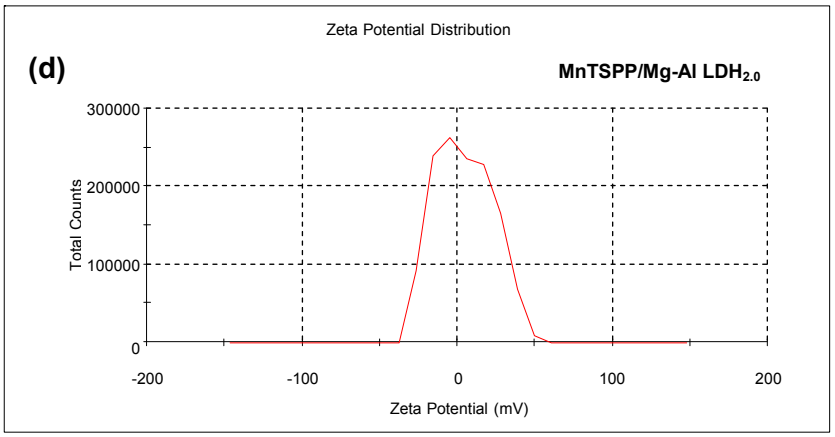


Fig. S2 SEM images of (a) Mg-Al-CO_3 LDHs and (b) Ni-Al-CO_3 LDHs.


Zeta Potential Distribution
(a)
Mg-Al LDH nanosheets
600000
500000
400000
300000
200000
100000
0
Total Counts
-200
-100
0
100
200
Zeta Potential (mV)


Zeta Potential Distribution
(b)
MnTSPP/Mg-Al LDH0.5
300000
200000
100000
0
Total Counts
-200
-100
0
100
200
Zeta Potential (mV)


Zeta Potential Distribution
(c)
MnTSPP/Mg-Al LDH1.0
200000
150000
100000
50000
0
Total Counts
-200
-100
0
100
200
Zeta Potential (mV)


Zeta Potential Distribution
(d)
MnTSPP/Mg-Al LDH2.0
300000
200000
100000
0
Total Counts
-200
-100
0
100
200
Zeta Potential (mV)

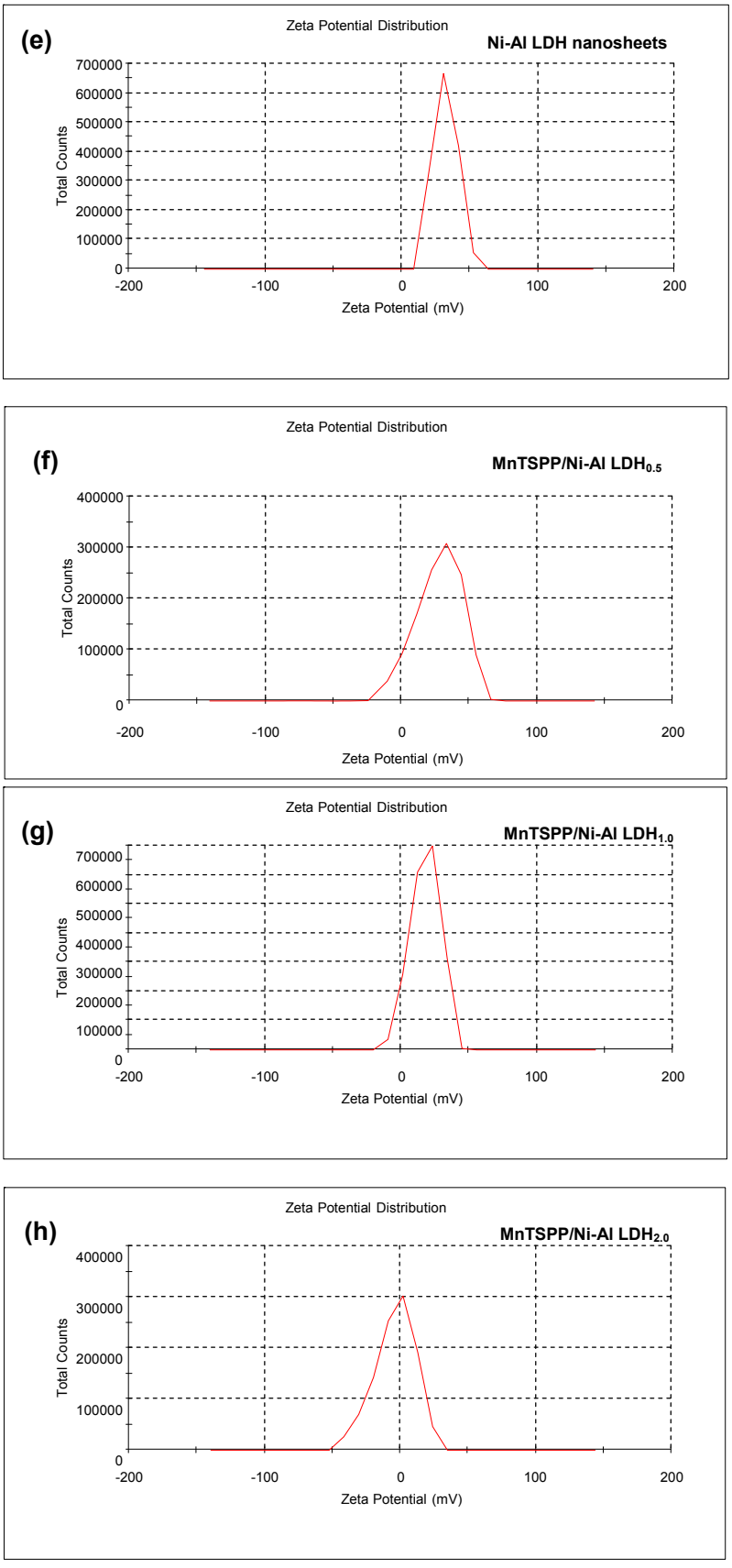


Fig. S3 Zeta potential changes with the addition of different volumes of MnTSPP aqueous solution into Mg-Al LDH (a~d) and Ni-Al LDH (e~h) nanosheets in formamide.