

## Supporting Information

### **Preparation of water-dispersed monolayer LDH nanosheets by SMA intercalation to hinder the restacking upon redispersion in water**

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## **1. Experimental section**

### **1.1 Materials.**

Styrene-maleic anhydride copolymer (SMA, Mw=5500) was obtained from Jiaxing Huawen Chemical Co., Ltd. (Jiaxing, China). Mg(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O (purity > 98 %), Al(NO<sub>3</sub>)<sub>3</sub>·9H<sub>2</sub>O (purity > 98 %), Zn(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O (purity > 98 %), Fe(NO<sub>3</sub>)<sub>3</sub>·9H<sub>2</sub>O (purity > 98 %) and NaOH (purity > 98 %), were purchased from Aladdin Chemical Co., Ltd. (Shanghai, China). These chemicals were all used as received without further purification.

## **1.2 Synthesis of m-LDH nanosheets and SMA-LDH powder**

$1.1 \times 10^{-3}$  mol SMA were dispersed in a solution containing 50 ml NaOH (4 M) and 50 ml DI water, and stirred at room temperature for 2 h. After that, A salt solution (100 mL) containing a mixture of 0.075 mol  $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  and 0.025 mol  $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$  was added dropwise. The pH was adjusted to 10 by dropwise addition of NaOH (4 M). The resulting reaction mixture was aged at room temperature for 12 h with stirring at 700 rpm. After ageing, the colloidal solutions of monolayer LDH nanosheets (m-LDH) were obtained, and the m-LDH gel was collected by centrifuged and washed thoroughly with deionized water until it had a pH close to 7, the SMA-LDH was obtained by the m-LDH gel dried at 60 °C overnight in an oven.

Similarly, SMA-ZnFe-LDH was also prepared [using  $\text{Zn}(\text{NO}_3)_2$  to replace  $\text{Mg}(\text{NO}_3)_2$ ,  $\text{Fe}(\text{NO}_3)_3$  to replace  $\text{Al}(\text{NO}_3)_3$ ] following the same method. After ageing, the m-ZnFe LDH gel was collected by centrifuged and washed thoroughly with deionized water until it had a pH close to 7, the SMA-ZnFe-LDH was obtained by the m-LDH gel dried at 60 °C overnight in an oven.

## **1.3 Synthesis of r-m-LDH**

The above obtained 1 g SMA-LDH powder was dispersed in 100 ml deionized water, stirring and ultrasonic treatment for 30 min.

Likewise, the r-m-ZnFe LDH was obtained by dispersing 1 g of SMA-ZnFe-LDH powder in 100 ml of deionized water, followed by stirring and ultrasonic treatment for 30 min.

## **1.4 Characterization of samples**

The phase compositions and crystallographic structures of as-synthesized samples were determined by powder X-ray diffraction (XRD) measurements performed on a ARL EQUINOX 3000 instrument in reflection mode with Cu K radiation, Scanning 15 min. The functional groups of the LDH were identified by Attenuated total reflectance Fourier transform infrared spectra (ATR-FTIR, NEXUS570, Nicolet, America). The morphologies of the samples were characterized by field-emission scanning electron microscopy (SEM, Quanta 250 FEG, FEI, America). Before observation, the dried samples were sputtered and coated with gold, for ~30 s under an argon atmosphere. High resolution transmission electron microscopy (HR-TEM) images were obtained on a FEI Tecnai G2 F20, operating at 200 kV. A Bruker Dimension Icon atomic force microscopy (AFM) system was used to examine the thickness of nanosheets deposited onto Si wafers.



Figure S1 Product of m-LDH prepared by our new method. Inset: Highly dispersed m-LDH with a clear Tyndall effect.

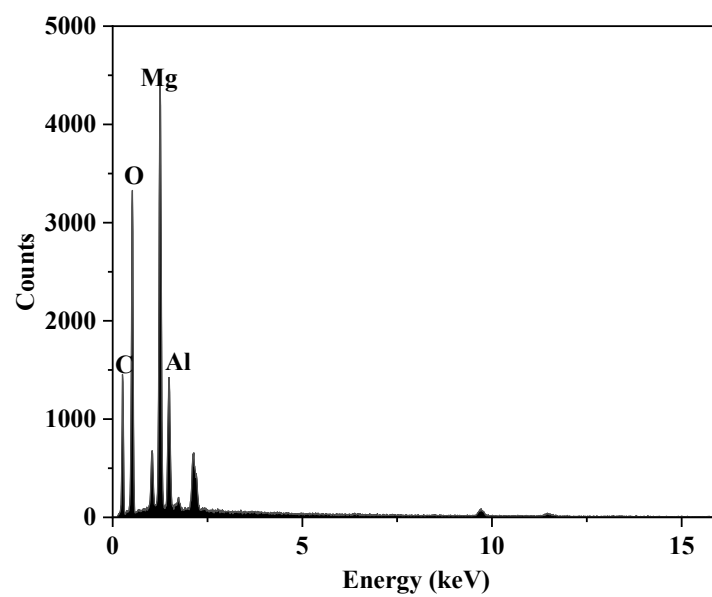


Figure S2 EDS spectrum of SMA-LDH.

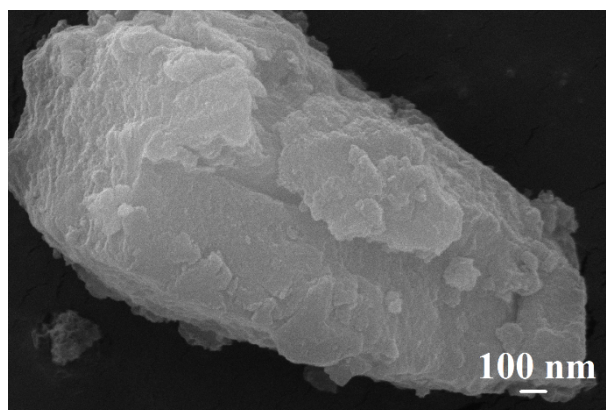


Figure S3 SEM image of SMA-LDH.

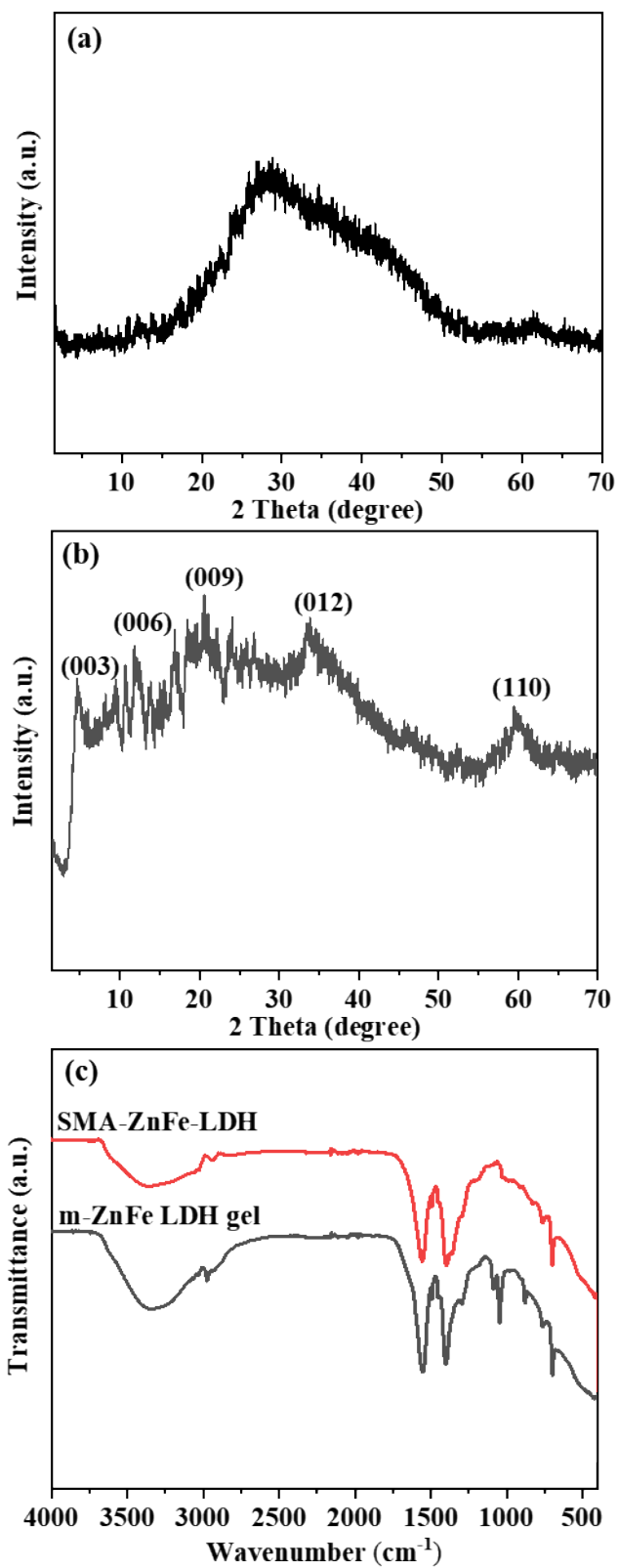


Figure S4 (a) XRD pattern of m-ZnFe LDH, (b) XRD pattern of SMA-ZnFe-LDH, and (c) ATR-FTIR spectra of m-ZnFe LDH, and SMA-ZnFe-LDH.

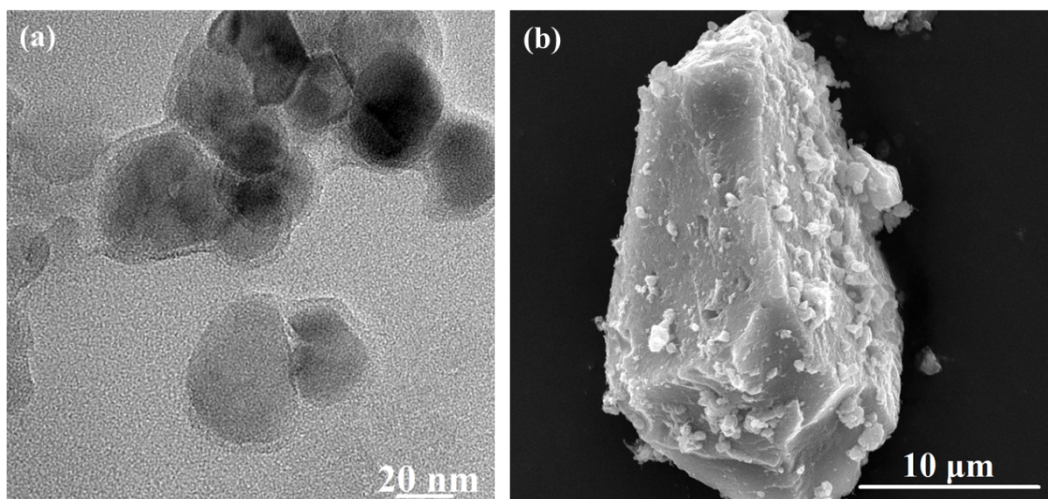


Figure S5 (a) TEM image of m-ZnFe LDH, (b) SEM image of SMA-ZnFe-LDH.

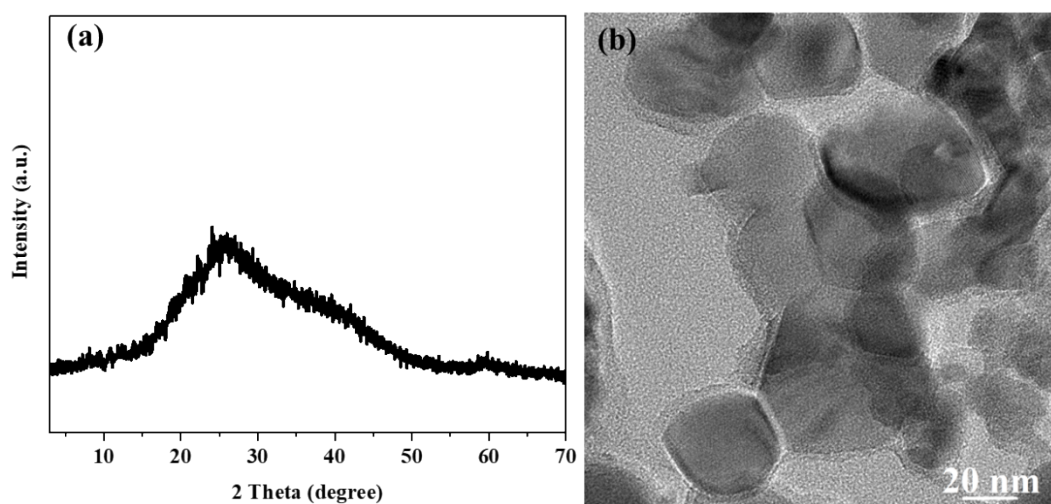


Figure S6 (a) XRD pattern of r-m-ZnFe LDH, Inset: Highly dispersed r-m-ZnFe LDH with a clear Tyndall effect, (b) TEM image of r-m-ZnFe LDH.

## References

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