

Controlled growth of LDH films with enhanced photocatalytic activity in a mixed wastewater treatment

Zhongchuan Wang¹, Pengfei Fang¹, Parveen Kumar², Weiwei Wang^{*1}, Bo Liu^{*1,2}, and Jiao Li¹

¹School of Material Science and Engineering, Shandong University of Technology, Zibo 255000, China;

²Laboratory of Functional Molecular and Materials, School of Physics and Optoelectronic Engineering, Shandong University of Technology, Zibo 255000, China; wangzhongchuan1994@163.com (Z.W.); 17864373857@163.com (P.F.); kumar@sdut.edu.cn (P.K.); haiyan9943@163.com (J.L.)

*Correspondence: wangweiwei@sdut.edu.cn (W.W.); liub@sdut.edu.cn (B.L.); Tel.: +8615689078202(W.W.); +86-533-2783909 (B.L.)

Table S1. XPS Peak positions for Fe³⁺ obtained from LDH films and Fe-doped LDH films.

Film No.	Peak position (eV)	
	2p1/2	2p3/2
NiAl-LDH films	--	--
NiFe-LDH films	726.28	712.78
Fe-doped NiAl-LDH films	725.88	712.88
Fe-doped NiFe-LDH films	725.68	712.78

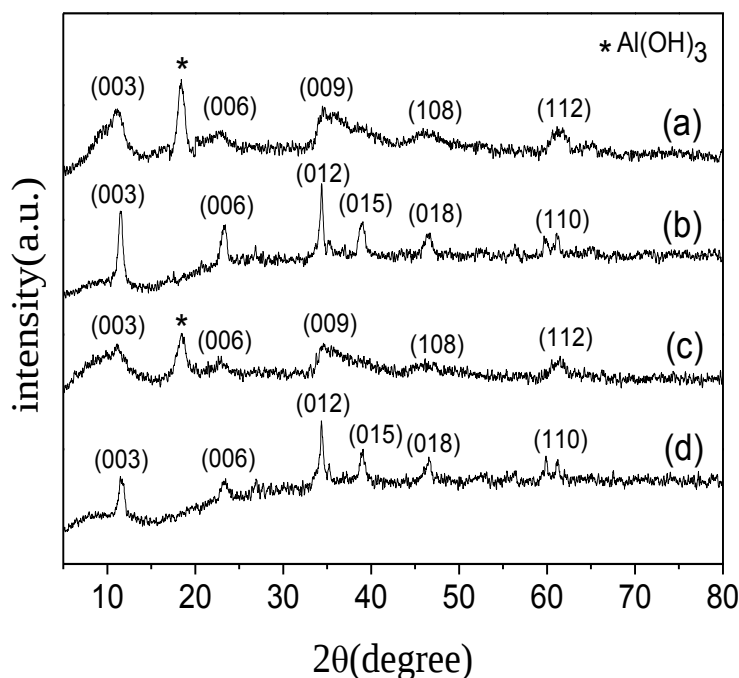


Figure S1. XRD patterns. (a) NiAl-LDH films, (b) NiFe-LDH films, (c) Fe-doped NiAl-LDH films, and (d) Fe-doped NiFe-LDH films.

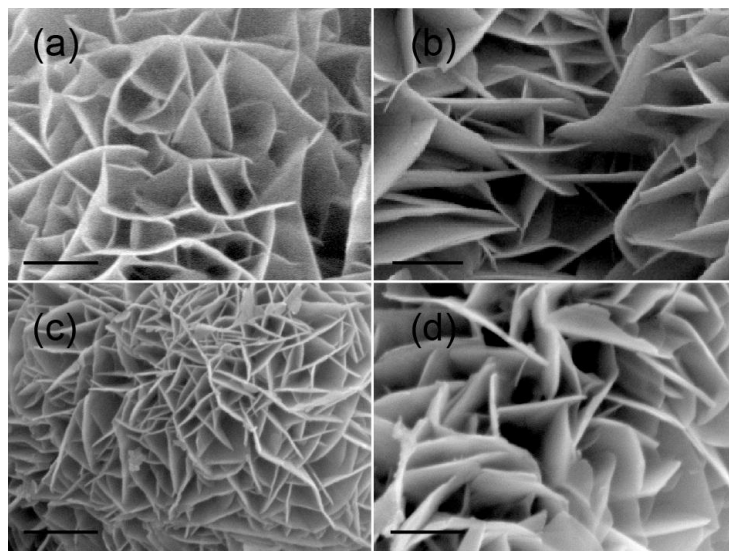


Figure S2. SEM images. (a) NiAl-LDH powders, (b) NiFe-LDH powders, (c) Fe-doped NiAl-LDH powders, and (d) Fe-doped NiFe-LDH powders.

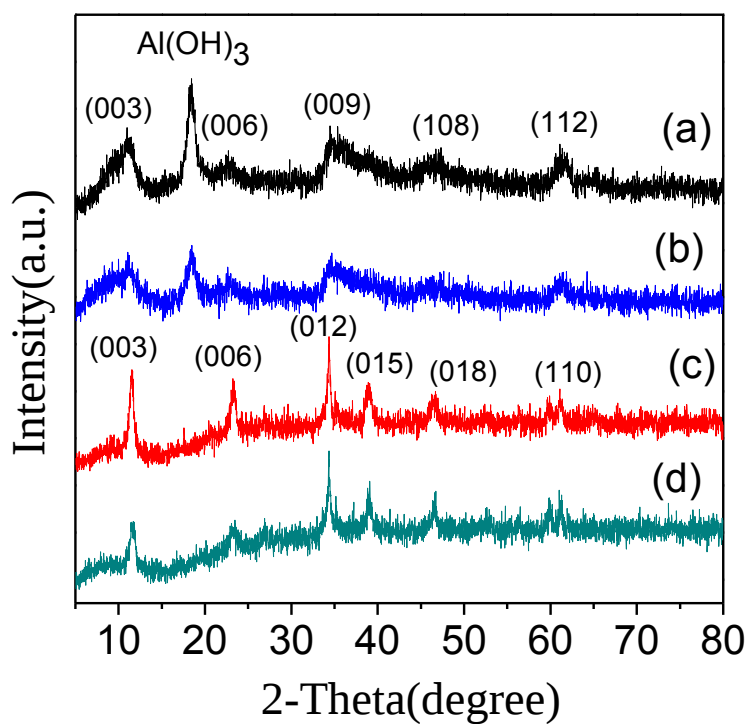


Figure S3. XRD patterns. (a) NiAl-LDH powders, (b) Fe-doped NiAl-LDH powders, (c) NiFe-LDH powders, and (d) Fe-doped NiFe-LDH powders.

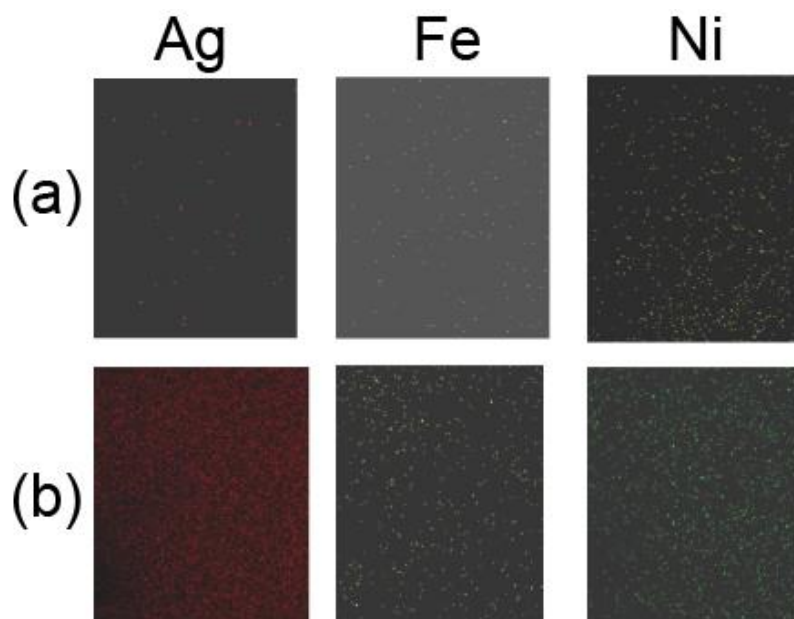


Figure S4. EDS elements mapping for Fe-doped NiAl-LDH films after the photocatalytic degradation in the presence of methyl orange ($20 \text{ mg}\cdot\text{L}^{-1}$) and Ag ions ($5 \text{ mg}\cdot\text{L}^{-1}$). (a) Area without Ag particles, (b) area with Ag particles.

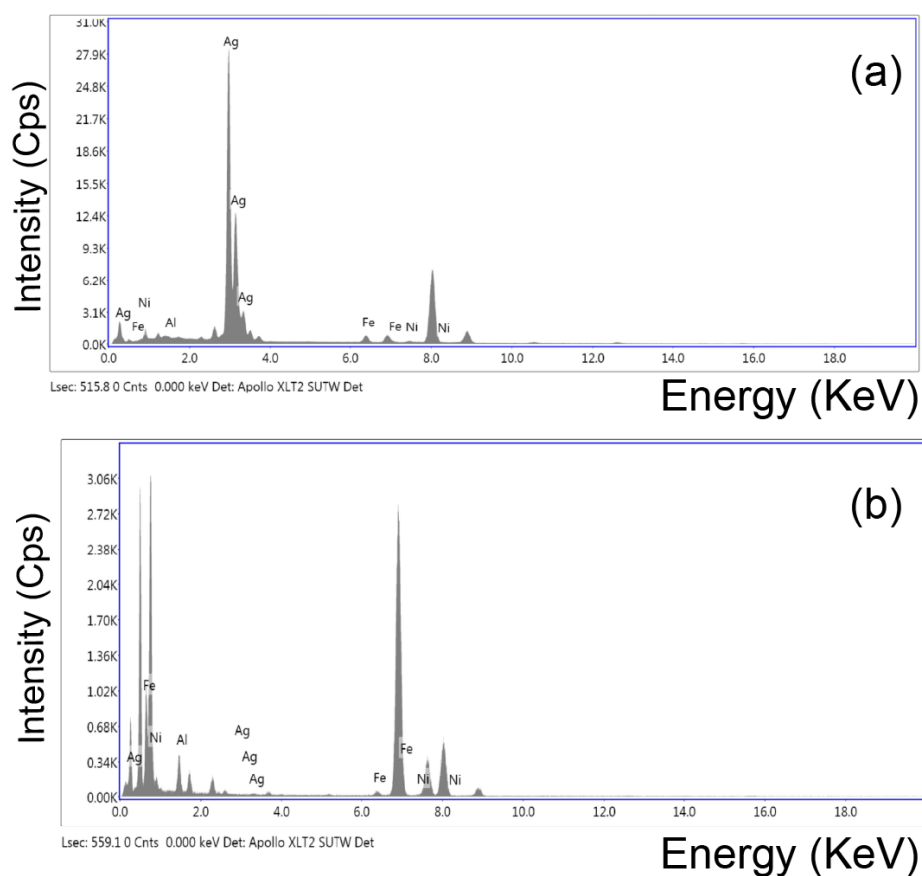


Figure S5. EDS spectra for Fe-doped NiAl-LDH films after photocatalytic reaction in the presence of $5 \text{ mg}\cdot\text{L}^{-1}$ Ag ions. (a) Area with Ag nanoparticles, (b) area without Ag nanoparticles in Figure 7(c).

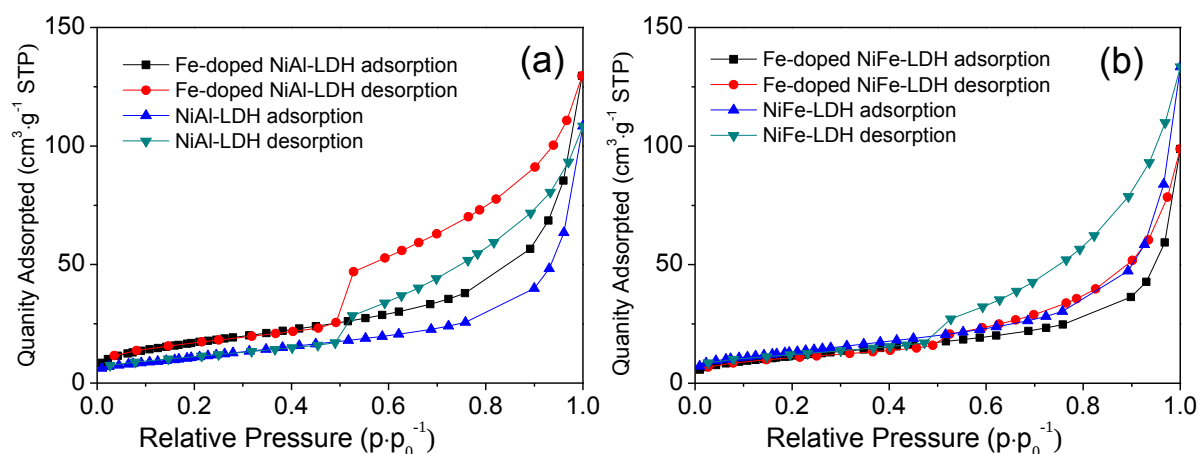


Figure S6. N₂ adsorption/desorption isotherms of (a) NiAl-LDH powders and Fe-doped NiAl-LDH powders, (b) NiFe-LDH powders and Fe-doped NiFe-LDH powders.

All LDH powders are a type IV isotherm with an H3 hysteresis loop, owing to the aggregation of LDHs nanosheets. The specific surface area for NiAl-LDH powders, NiFe-LDH powders, Fe-doped NiAl-LDH powders, and Fe-doped NiFe-LDH powders are 42.26 m²·g⁻¹, 43.09 m²·g⁻¹, 48.37 m²·g⁻¹, and 42.82 m²·g⁻¹, respectively. The pore size for NiAl-LDH powders, NiFe-LDH powders, Fe-doped NiAl-LDH powders, and Fe-doped NiFe-LDH powders are 14.35 nm, 12.92 nm, 10.38 nm, and 14.27 nm, respectively.