Electronic Supplementary Information

Carbon Dots/NiAl-layered double hydroxide hybrid material: facile synthesis, intrinsic peroxidase-like catalytic activity and its application

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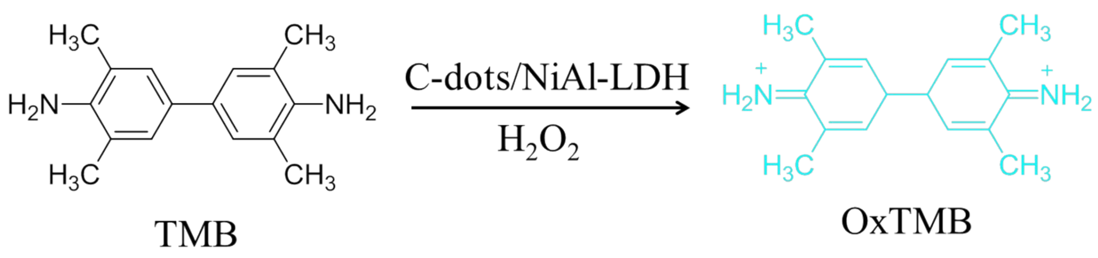
S1. EXPERIMENTAL SECTION

S1.1 Preparation of C-dots

Citric acid monohydrate (2 g) was heated hydrothermally in a Teflon-equipped stainless-steel autoclave at 200 °C for 3 h. After cooling to room temperature, the orange syrup product was neutralized with NaOH solution (1 mol L^{-1}) and further dialyzed against double distilled water through a dialysis membrane for 24 h (MWCO of 1 KDa). After that, the C-dots solution was diluted to 100 mL before use.

Table S1 Comparison of K_m and V_m of C-dots/NiAl-LDH and HRP.

Catalyst	**Substrate**	**Km (mM)**	**V_m (10^{-8} M s^{-1})**	**Refs**
C-dots/NiAl-LDH	TMB	0.34	5.52	This work
C-dots/NiAl-LDH	H_2O_2	4.72	7.89	This work
HRP	TMB	0.43	10.00	2
HRP	H_2O_2	3.70	8.71	2



Scheme S1. The oxidation reaction of TMB catalyzed by C-dots/NiAl-LDH in the presence of H_2O_2.

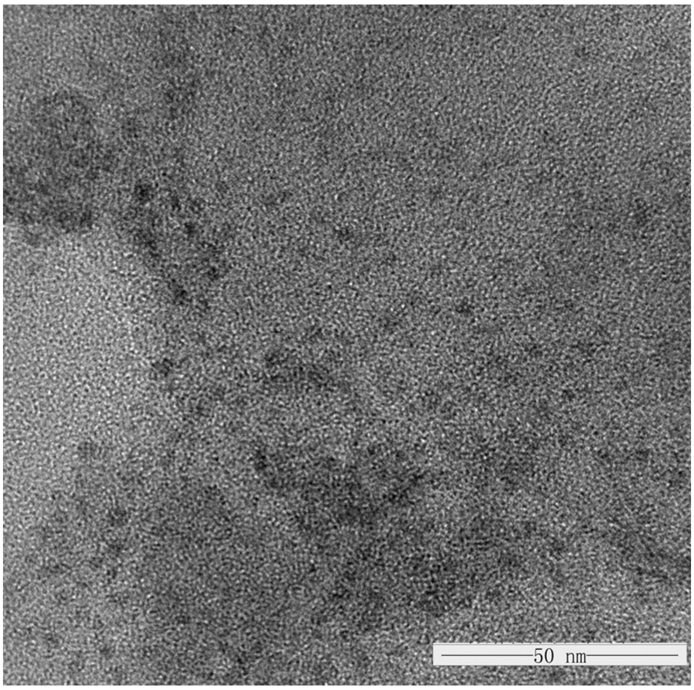
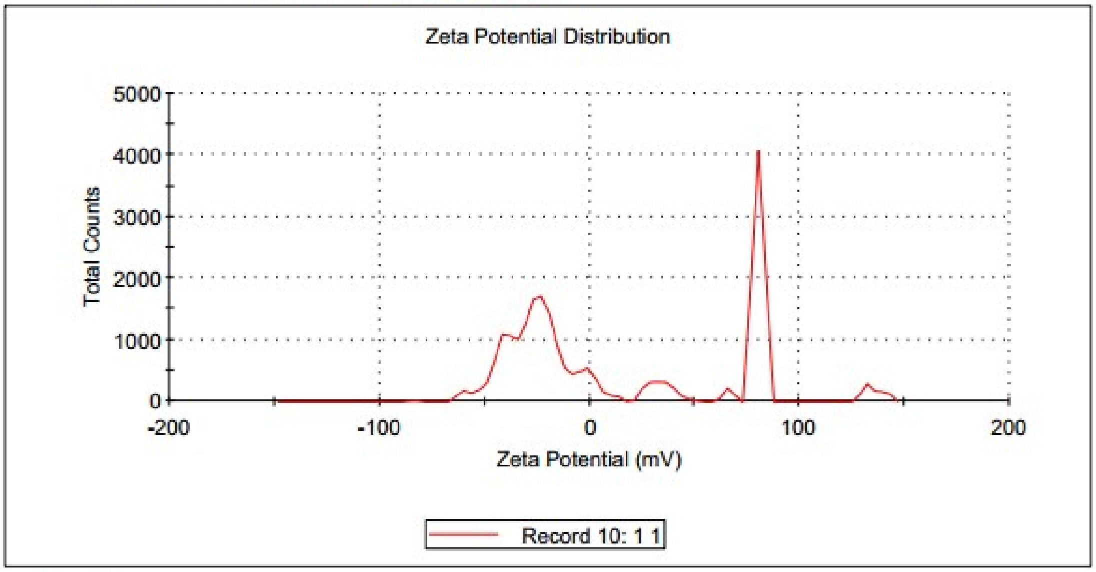


Figure S1. TEM image of C-dots/NiAl-LDH with different magnification.

Results

			Mean (mV)	Area (%)	Width (mV)
Zeta Potential (mV):	-3.96	Peak 1:	-23.2	33.4	7.07
Zeta Deviation (mV):	93.3	Peak 2:	80.3	29.4	2.58
Conductivity (mS/cm):	0.578	Peak 3:	-40.9	16.6	5.76

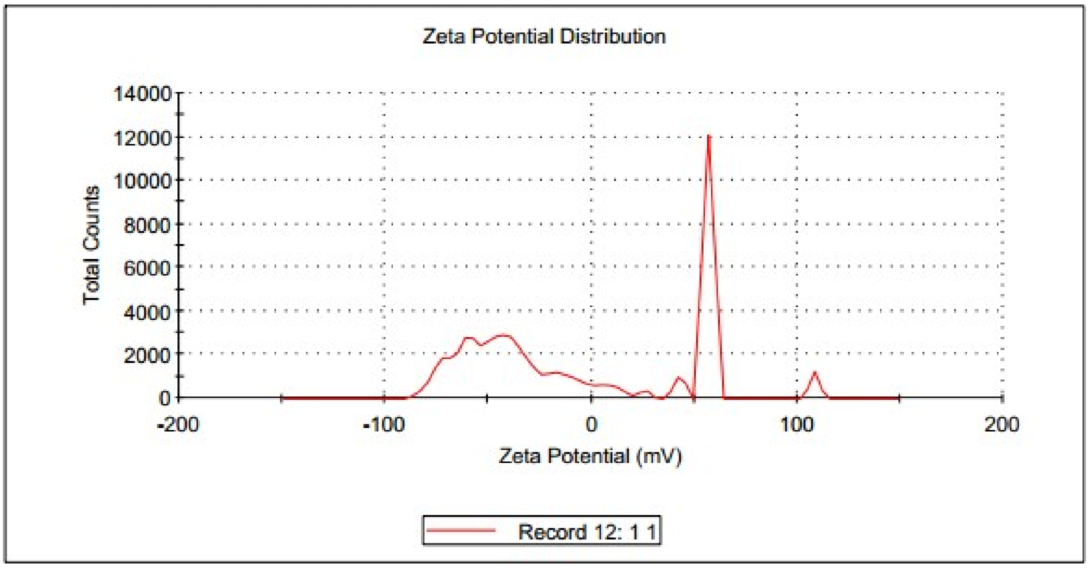
Result quality **See result quality report**



Results

			Mean (mV)	Area (%)	Width (mV)
Zeta Potential (mV):	-5.90	Peak 1:	56.8	30.2	2.58
Zeta Deviation (mV):	63.0	Peak 2:	-41.0	26.3	8.60
Conductivity (mS/cm):	0.589	Peak 3:	-60.5	15.3	4.97

Result quality **See result quality report**



Results

			Mean (mV)	Area (%)	Width (mV)
Zeta Potential (mV):	-5.41	**Peak 1:**	-35.2	34.3	8.97
Zeta Deviation (mV):	81.8	**Peak 2:**	64.9	31.3	2.57
Conductivity (mS/cm):	0.584	**Peak 3:**	-55.5	11.7	4.94

Result quality See result quality report

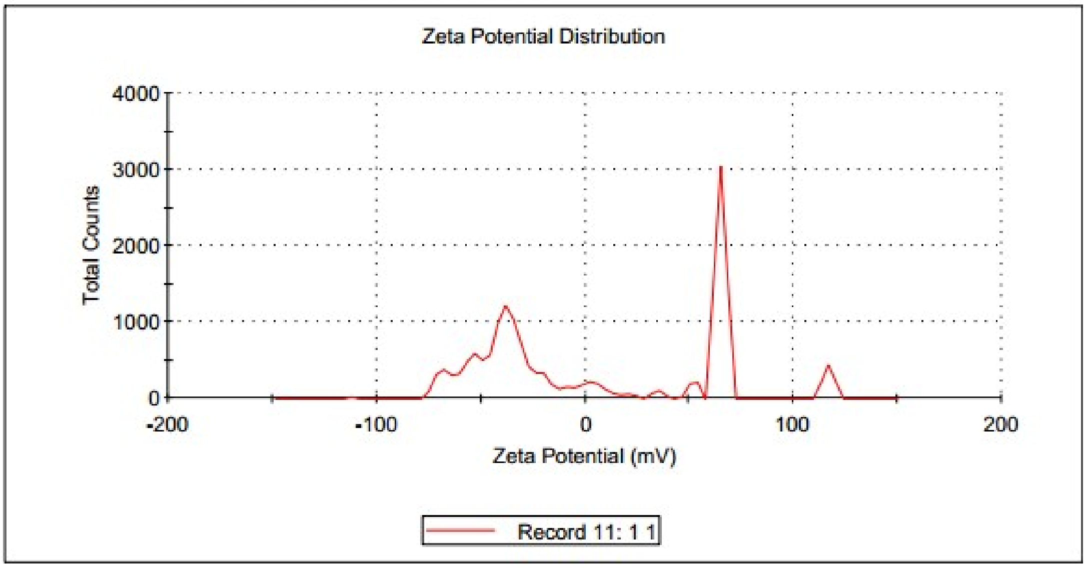
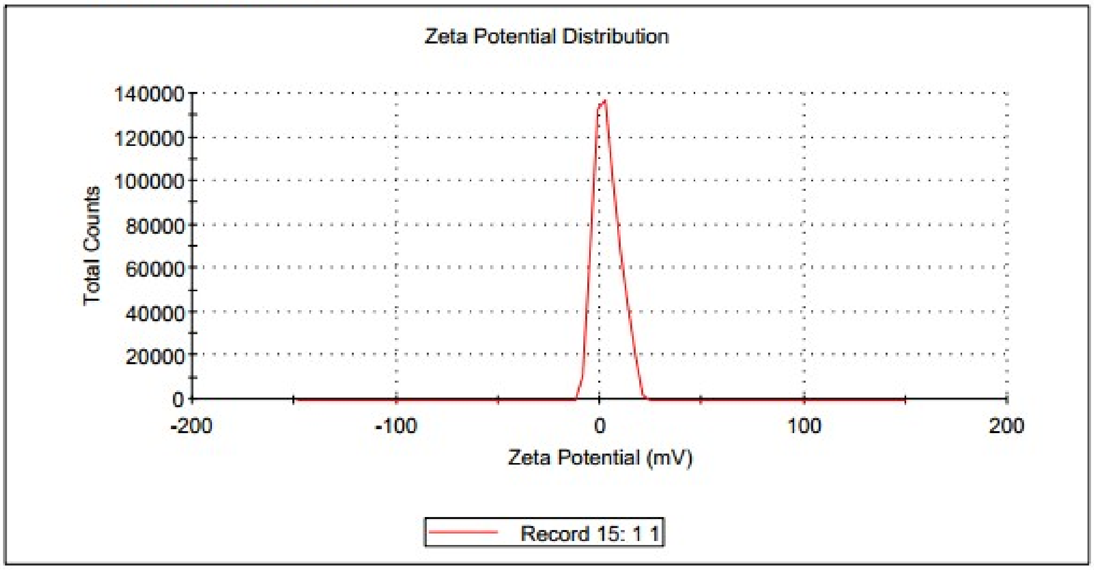


Figure S2. Zeta potential of the prepared C-dots.

Results

			Mean (mV)	Area (%)	Width (mV)
Zeta Potential (mV):	3.46	**Peak 1:**	3.46	100.0	6.12
Zeta Deviation (mV):	6.12	**Peak 2:**	0.00	0.0	0.00
Conductivity (mS/cm):	0.130	**Peak 3:**	0.00	0.0	0.00

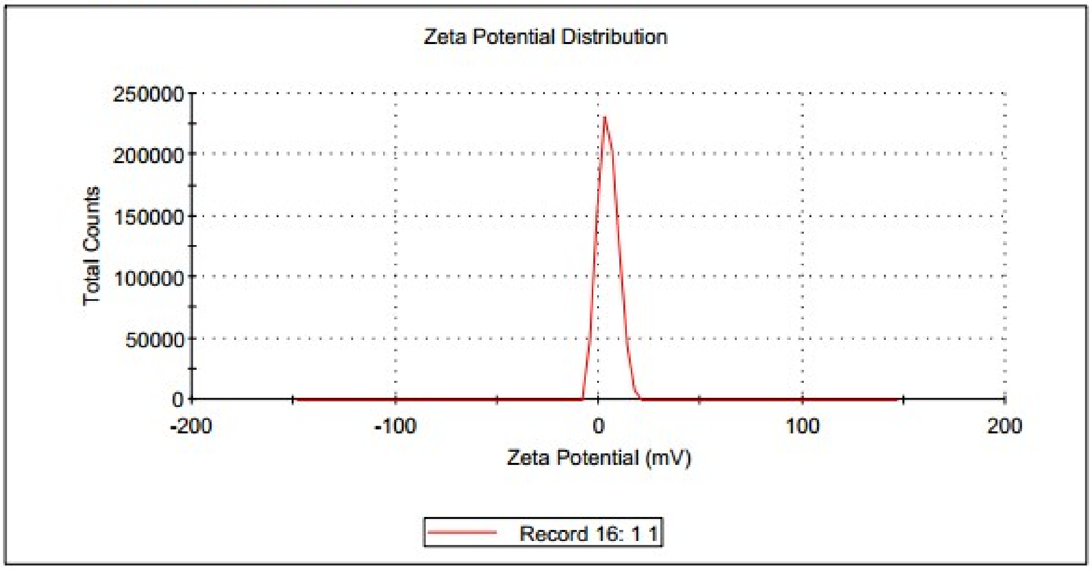
Result quality Good



Results

			Mean (mV)	Area (%)	Width (mV)
Zeta Potential (mV):	4.42	Peak 1:	4.42	100.0	4.85
Zeta Deviation (mV):	4.85	Peak 2:	0.00	0.0	0.00
Conductivity (mS/cm):	0.132	Peak 3:	0.00	0.0	0.00

Result quality Good



Results

			Mean (mV)	Area (%)	Width (mV)
Zeta Potential (mV):	3.33	Peak 1:	3.33	100.0	6.27
Zeta Deviation (mV):	6.27	Peak 2:	0.00	0.0	0.00
Conductivity (mS/cm):	0.132	Peak 3:	0.00	0.0	0.00

Result quality Good

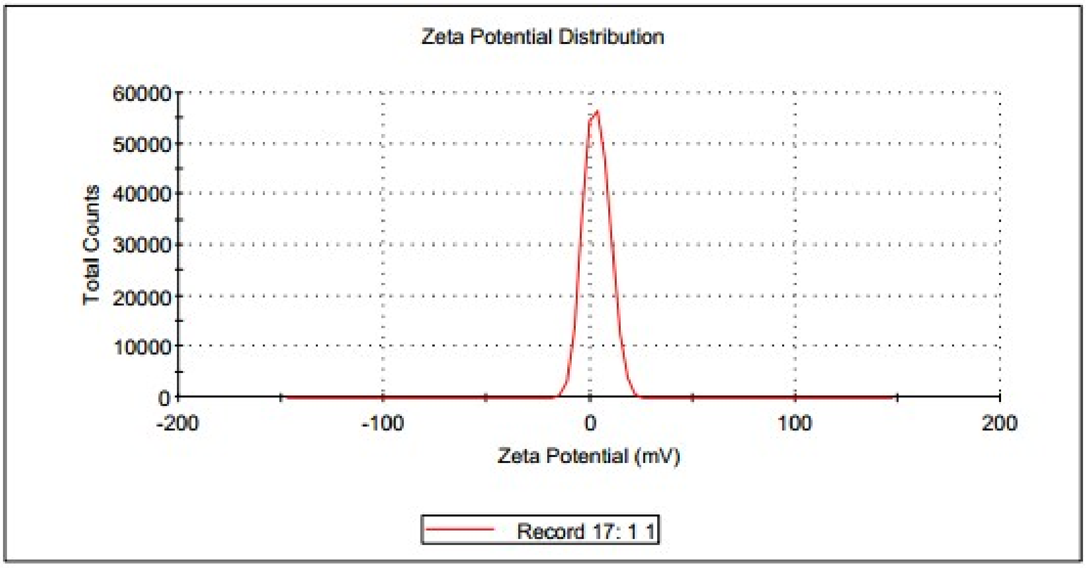


Figure S3. Zeta potential of the NiAl-LDH.

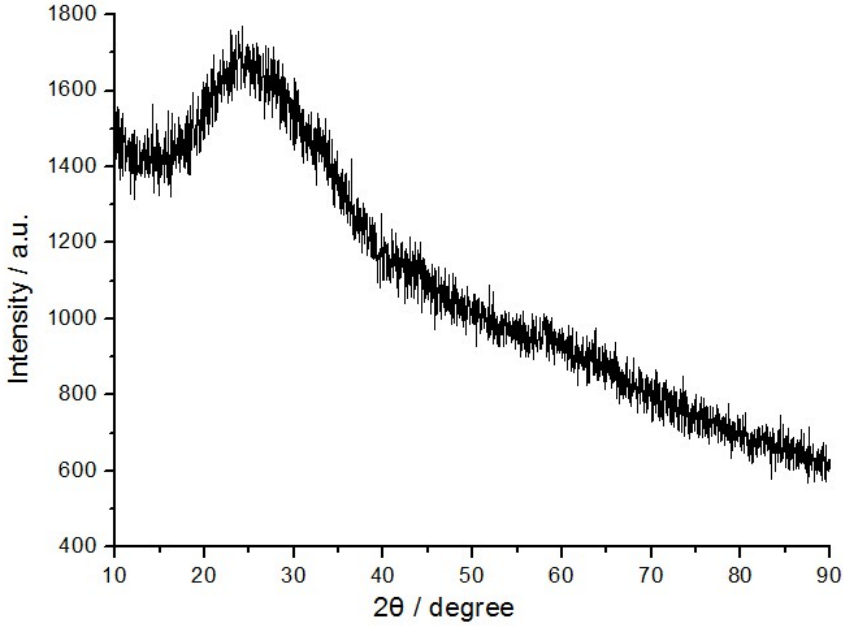


Figure S4. XRD spectrum of C-dots deposited on a glass slide.

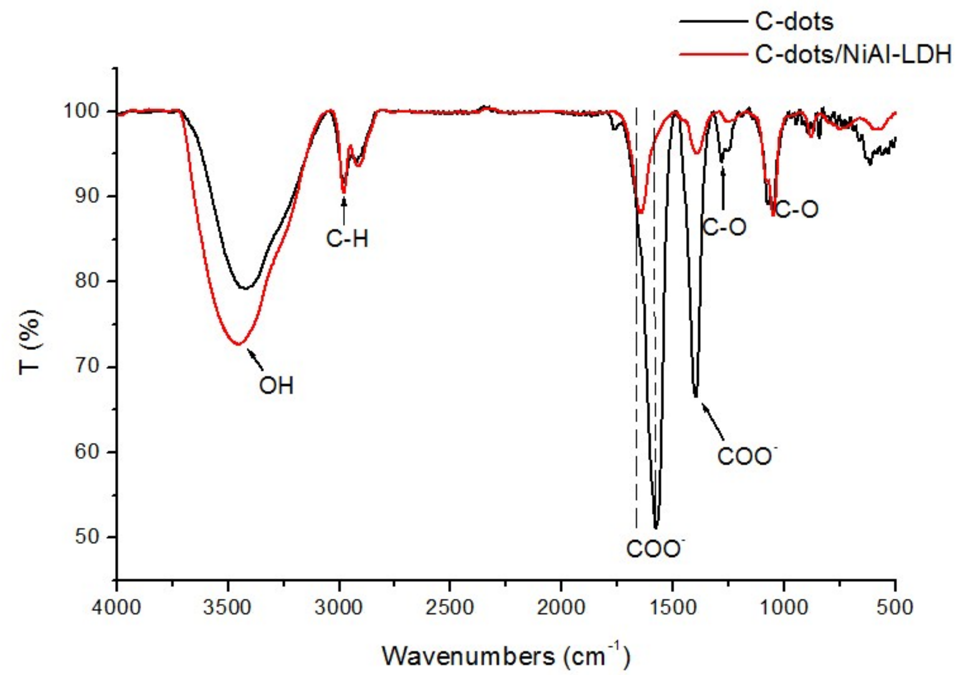


Figure S5. FTIR spectra of C-dots and C-dots/NiAl-LDH dried from an aqueous suspension using KBr pellets.

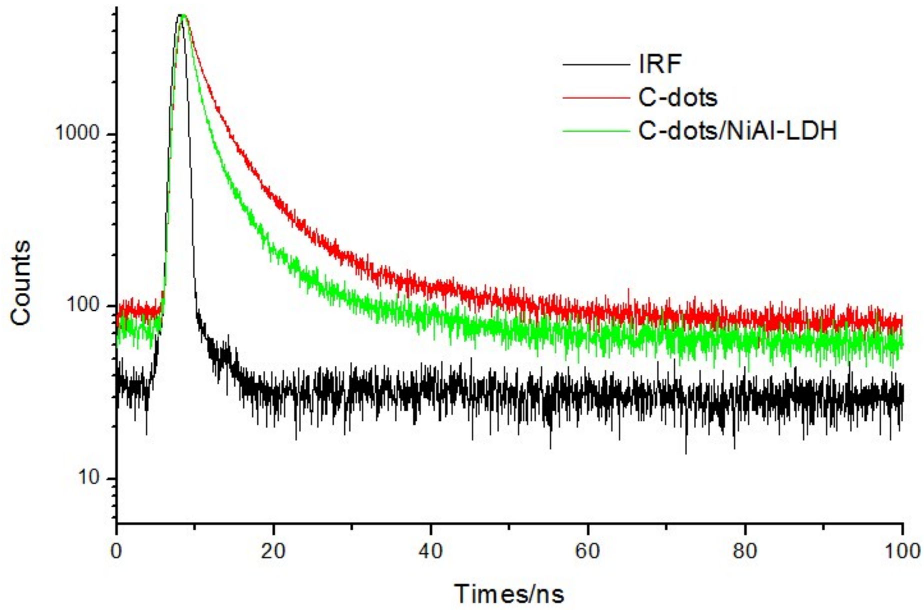


Figure S6. Fluorescence decay profiles (λ_{ex}= 330nm and λ_{em}= 420 nm) of C-dots and C-dots/NiAl-LDH aqueous suspension.

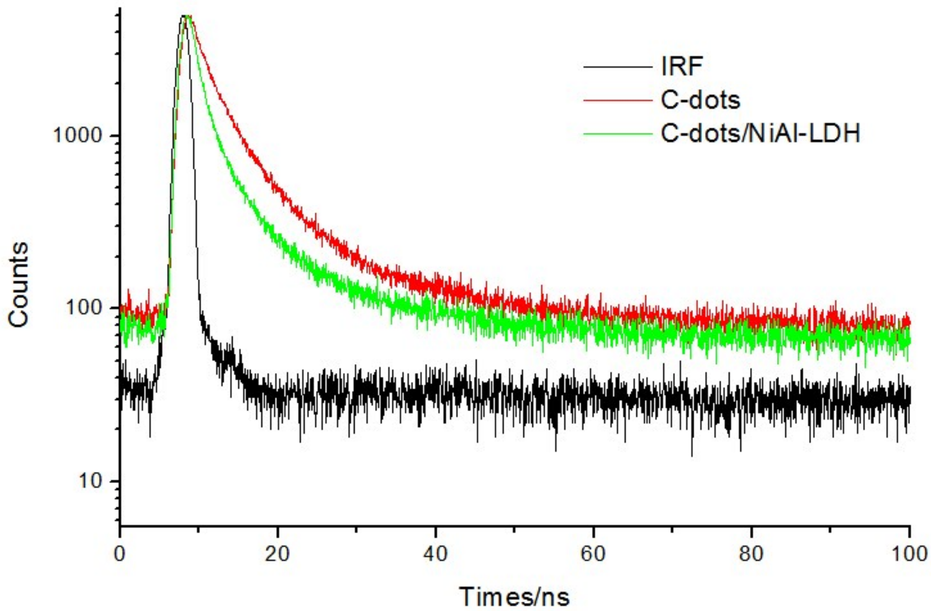


Figure S7. Fluorescence decay profiles (λ_{ex}= 330nm and λ_{em}= 460 nm) of C-dots and C-dots/NiAl-LDH aqueous suspension.

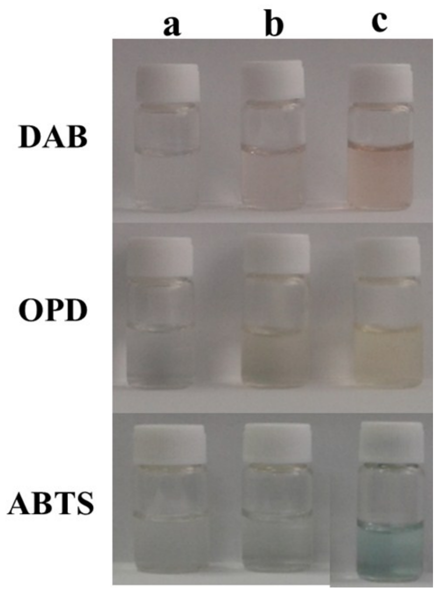


Figure S8. Typical photographs of other chromogenic peroxidase substrates catalyzed by C-dots/NiAl-LDH in the presence of H_2O_2: (a) substrate only, (b) substrate + H_2O_2, and (c) substrate + H_2O_2 + C-dots/NiAl-LDH.

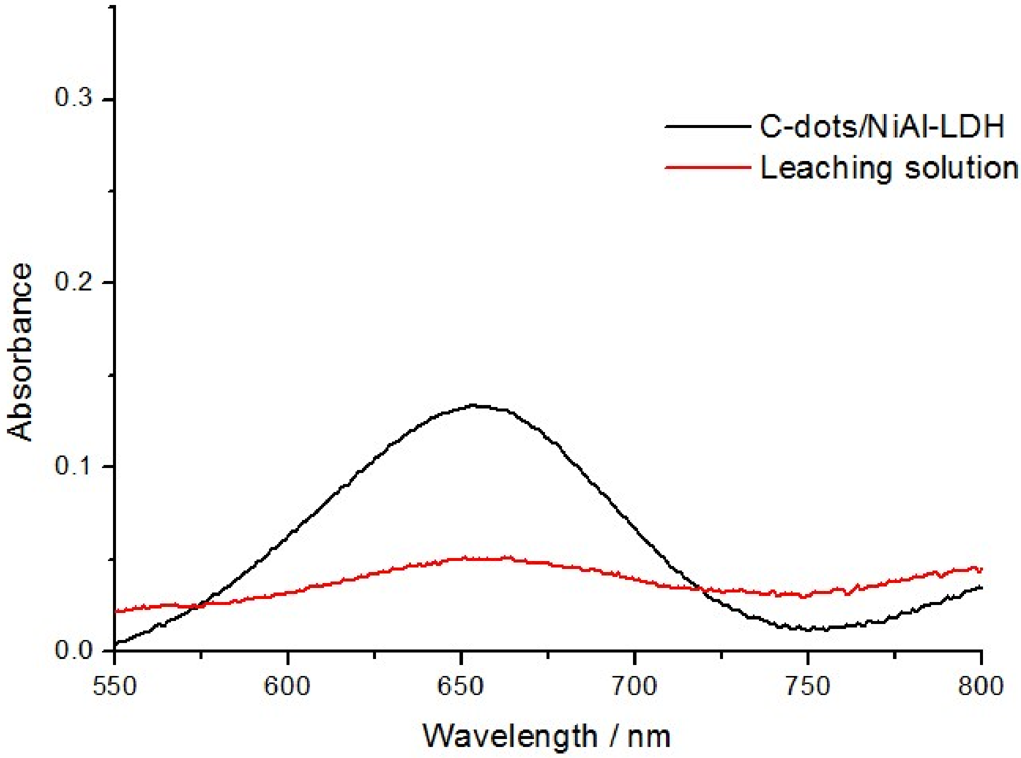


Figure S9. Comparison of absorbance spectra of C-dots/NiAl-LDH and leached solution catalyzed TMB oxidation in presences of H_2O_2.

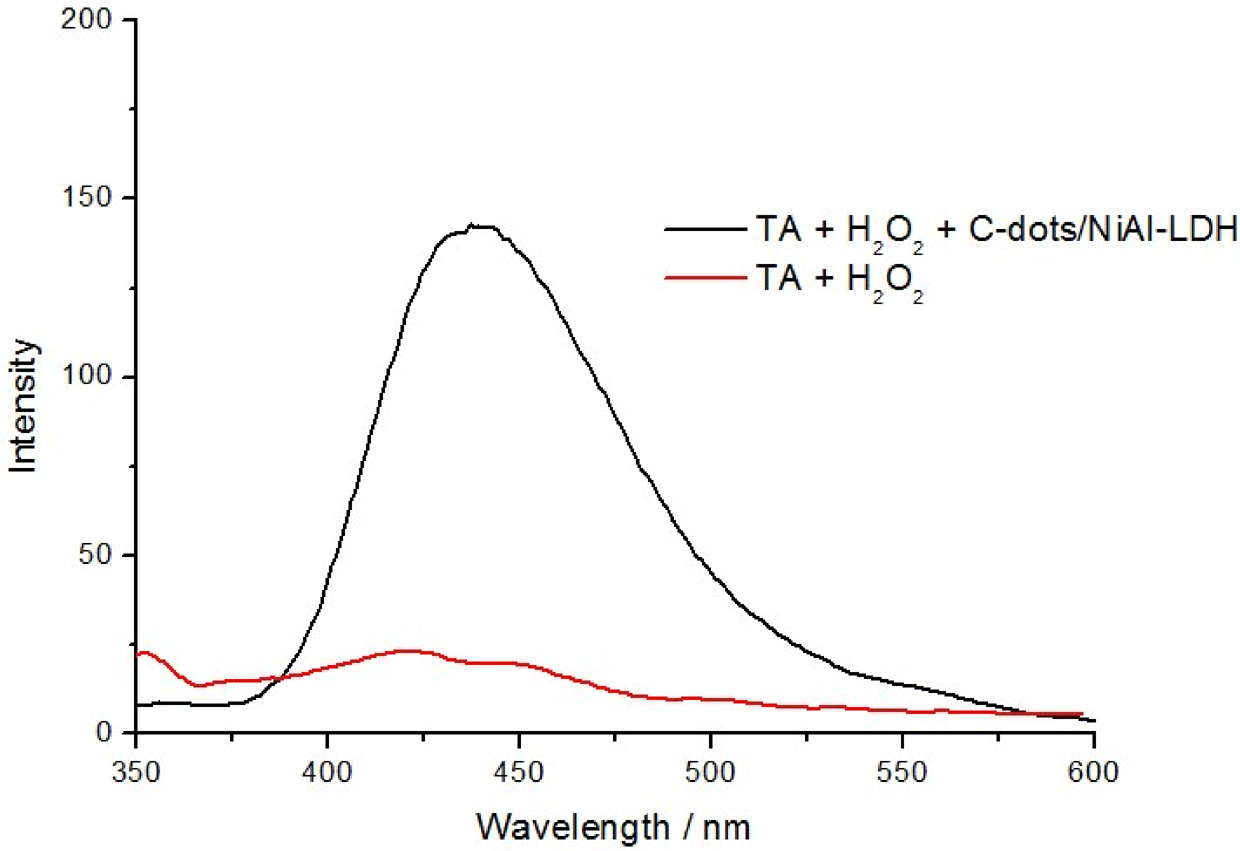


Figure S10. Emission spectra of TA in the presence of H_2O_2 and C-dots/NiAl-LDH. The reaction was performed in a TA solution (1 mM; 2 mL) with H_2O_2 (30 wt %; 6μL) and 20μL C-dots/NiAl-LDH. The fluorescence spectrum was then measured between λ = 350 and 600 nm with λ = 315 nm as the excitation wavelength.