materials

MDPI

Supplementary Materials

LDH-Co-Fe-Acetate: A New Efficient Sorbent for Azoic Dye Removal and Elaboration by Hydrolysis in Polyol, Characterization, Adsorption, and Anionic Exchange of Direct Red 2 as a Model Anionic Dye

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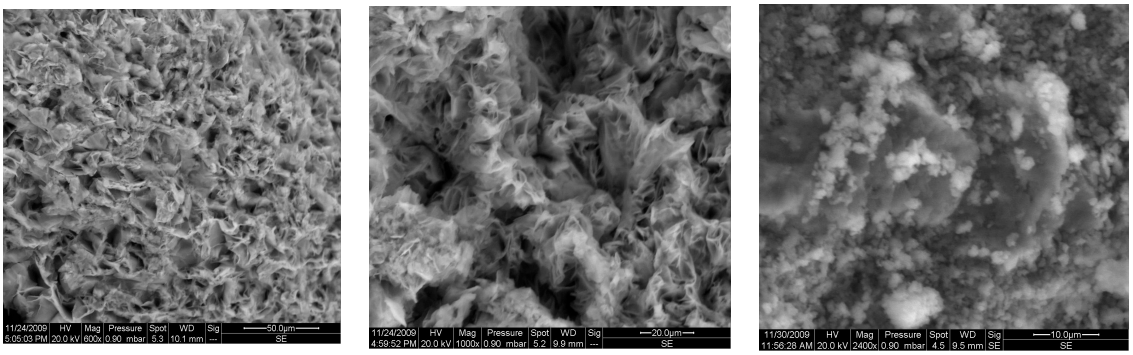
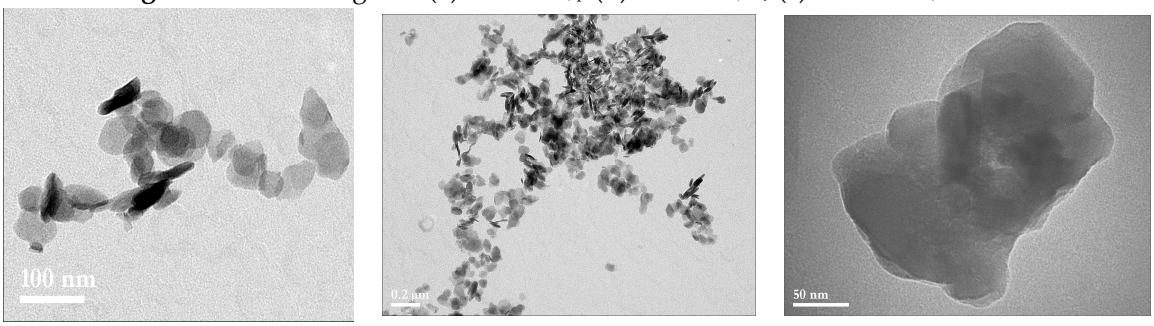


(**a**) (**b**) (**c**)

Figure S1. SEM images of (**a**) CoFe-Ac/$_{P,}$ (**b**) CoFe-Ac/$_{Ex}$, (**c**) CoFe-CO_3/$_A$ LDHs.



(**a**) (**b**) (**c**)

Figure S2. TEM images of **(a)** CoFe-Ac/$_{P,}$ (**b**) CoFe-Ac/$_{Ex}$, **(c)** CoFe-CO_3/$_A$ LDHs.

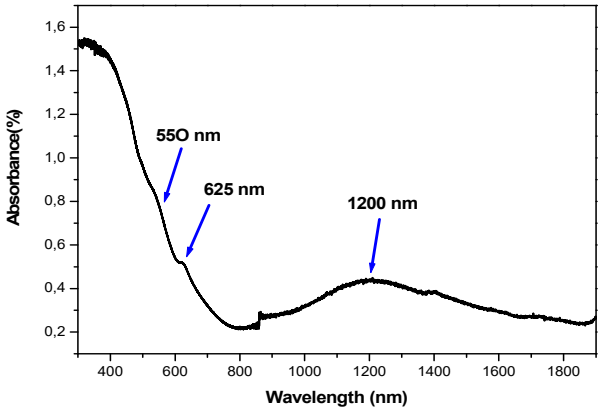


Figure S3. UV-Visible of of CoFe-Ac/$_P$ LDH.

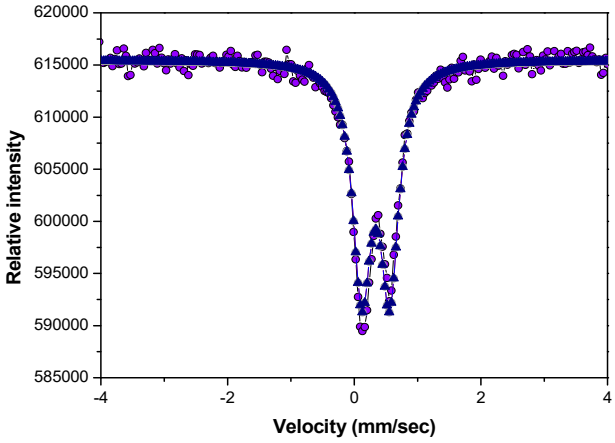
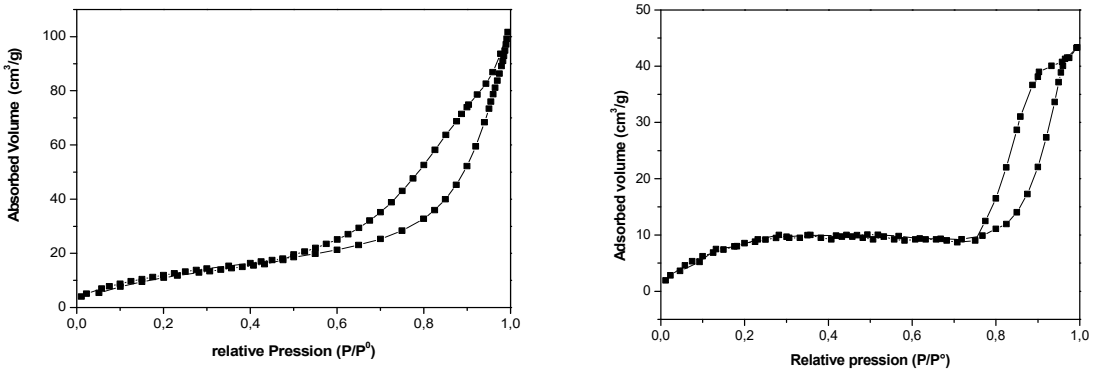


Figure S4. Mössbauer spectra of CoFe-Ac/$_P$ LDH.



(a) **(b)**

Figure S5. N_2 adsorption–desorption isotherms of (**a**) CoFe-Ac/$_P$ (**b**) CoFe-Ac/$_{Ex}$ LDHs

Table S1. Textural properties of CoFe-Ac/$_P$ and CoFe-CO_3/$_A$ LDHs.

Compound	S $_{BET}$ (m^2/g)	C_{BET}	Monolayer Volume V_m (cm^3/g)
CoFe-Ac/$_P$	48	22.78	11.17
CoFe-Ac/$_{Ex}$	50	24.02	11.52

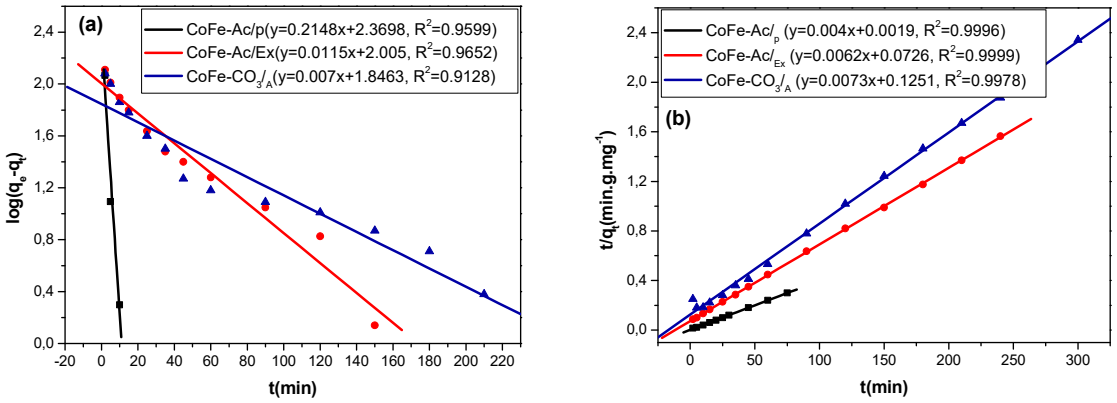


Figure S6. (**a**) Pseudo-first-order and (**b**) pseudo-second-order kinetics for adsorption of direct red 2 on CoFeAc/$_P$, CoFe-Ac/$_{Ex}$, and CoFe-CO$_3$/$_A$ LDHs.

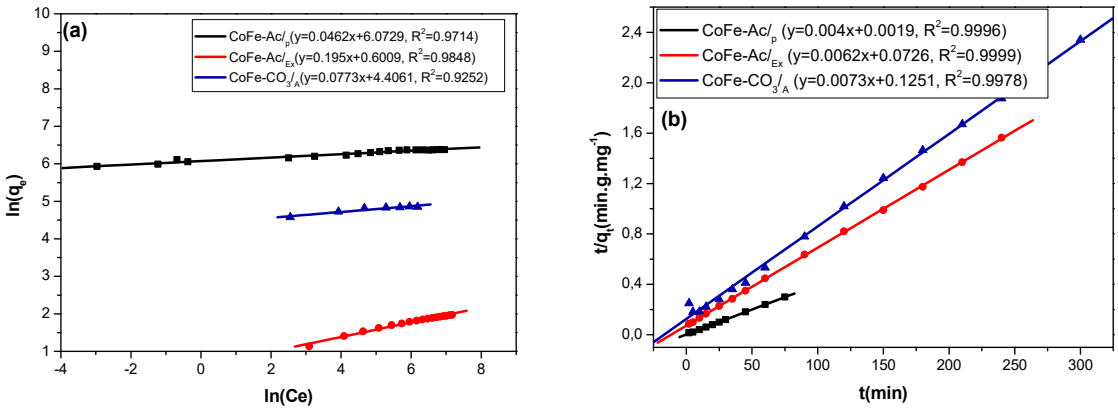


Figure S7. (**a**) Freundlich and (**b**) Langmuir isotherms for adsorption of direct red 2 on CoFe-Ac/$_P$, CoFe-Ac/$_{Ex}$, and CoFe-CO$_3$/$_A$ LDHs.

Toth model

Toth model was established from the Langmuir isotherm but by considering that the adsorption energy is not distributed homogeneously. Thus this model is of particular interest since it considers that the surface of the adsorbent is heterogeneous. In liquid phase, it is generally used like an adaptation of Langmuir model [1]. The Toth linear equation is given as:

$$\left(\frac{C_e}{q_e}\right)^n = \left(\frac{1}{q_m \times K_T}\right)^n + \left(\frac{1}{q_m}\right)^n \times (Ce)^n \quad \text{(S1)}$$

Where,

K_T is equilibrium Toth constant, Ce is the equilibrium concentration (mg/l), q_m is the maximum capacity of adsorption (mg/g) and n is the Toth exponent.

The constant of Toth K_T and the capacity of adsorption q_m are calculated from slop and intercept of the plot $(Ce/qe)^n = f(Ce)^n$.

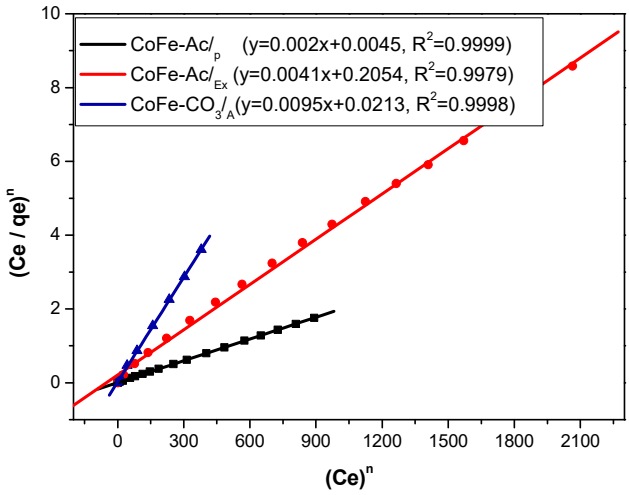


Figure S8. Toth isotherm for adsorption of direct red 2 on CoFe-Ac/$_{p}$, CoFe-Ac/$_{Ex}$, and CoFe-CO$_{3}$/$_{A}$ LDHs.

Table S2. Toth isotherm parameters for the adsorption of direct red 2 onto LDH samples.

Toth Isotherm	q_m (mg/g)	K_L	R^2
CoFe-Ac/$_{p}$	578.77	0.436	0.9999
CoFe-Ac/$_{Ex}$	175.49	0.0252	0.9979
CoFe-CO$_{3}$/$_{A}$	128.125	0.431	0.9998

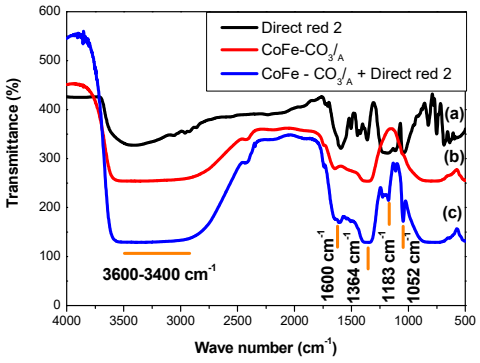


Figure S9. FT-IR spectra before and after adsorption for CoFe-CO$_{3}$/$_{A}$.

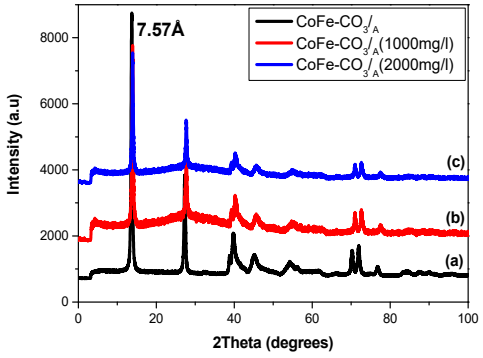


Figure S10. X-ray diffractogram before and after adsorption for $CoFe\text{-}CO_3/_A$.

Reference

1. *Toth, J.* Gas-(Dampf-)Adsorption auf festen Oberflecken inhomogener Aktivität, *III*, *Acta Chimica Academiae Scientarium Hungaricae*, **1962**, *32*, *39*.