Supplementary Material

Adsorption behaviors of cationic methylene blue and anionic reactive blue 19 dyes onto nano-carbon adsorbent carbonized from small precursors

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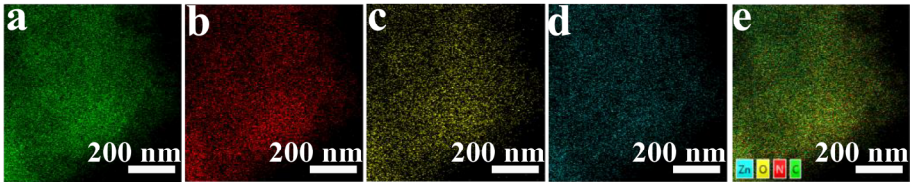

Figure S1. The TEM EDS spectrum of N-CM: (**a**) C, (**b**) N, (**c**) O, and (**d**) Zn elements, and (**e**) the overlay image of these four elements.

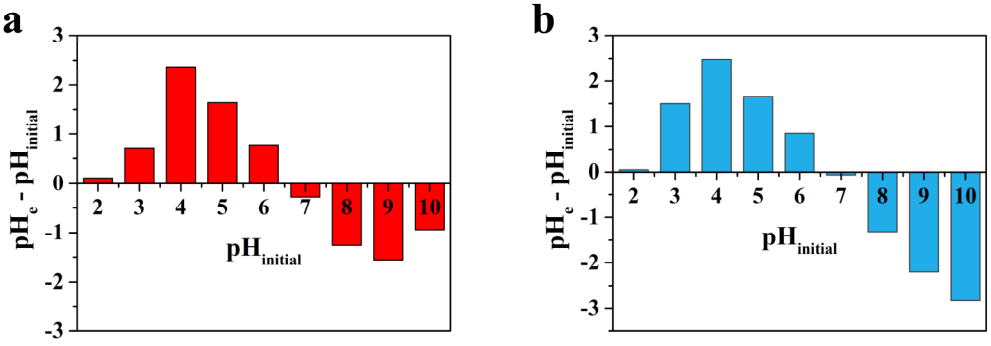

Figure S2. The pH variations between equilibrium and initiate pHs for (**a**) MB and (**b**) RB19 adsorption.

Table S1. Comparison of several absorbents toward MB and RB19 dye adsorption.

Adsorbate	Adsorbent	Synthetic Condition	Working Environment	Maximum Adsorption Capacity (mg/g)	Reference
MB	Electrolytic manganese anode slime	Hydroxylation of electrolytic manganese anode slime with EDTA-2Na	pH = 6.0	78.43 mg/g	[8]
MB	Biochar	Pyrolysis of mixed municipal discarded material at 300 °C	pH = 5 at 30 °C	7.2 mg/g	[24]
MB	Mesoporous Ni-C-N/silica aerogel	Impregnation of cationic $[Ni(trpa)]^{2+}$ complex onto silica aerogel followed by thermal treatment (200-600 °C)	pH = 4-10 at 30 °C	115 mg/g	[28]
MB	Lignocellulose hydrogel	Dissolution-regeneration of lemon peel and its microcrystalline cellulose	Aqueous solution	57.54 mg/g	[50]
MB	Cellulose-rich modified rice husk	Steam explosion and NaOH treatment	pH = 7.0	50.15 mg/g	[52]

MB	Fe_3O_4-loaded biochar	Oxygen-limited pyrolysis of $FeCl_3$-impregnated sorghum straw biomass	Aqueous solution	66.95/156.37 mg/g	[53]
MB	Mesoporous magnetic $MnFe_2O_4$@CS-SiO_2	Multi-chemical reactions containing hydrothermal synthesis	pH = 7.0 at 30 °C	179.25 mg/g	[54]
MB	Ti_3C_2 MXene@Fe_3O_4	Ti_3C_2 MXene functionalized with magnetic Fe_3O_4 via an in situ growth approach	pH = 3/11 at 55 °C	11.68 mg/g	[55]
MB	Mesoporous nitrogen-doped carbon material	Solvothermal treatment at 150 °C	Natural MB aqueous solution at 25 °C	120.77 mg/g	**This work**
RB19	Borax cross-linked Jhingan hydrogel	Borax cross-linked Jhingan hydrogel	pH = 6 at 45 °C	9.88 mg/g	[7]
RB19	Sewage sludge biochar	Pyrolysis at 450 °C	pH = 10	126.59 mg/g	[56]
RB19	Bone char	Preparation from bovine bone using CO_2 atmosphere at 451 °C	pH = 6.54	20.6 mg/g	[57]
RB19	Mesoporous activated carbon	Pyrolysis of industrial laundry sewage sludge at 750-800 °C followed by physical activation with CO_2	pH = 2.0	33.47 mg/g	[58]
RB19	Dried Aspergillus tubingensis	Isolation from filamentous fungus	pH = 2	143.0 mg/g	[59]
RB19	Nano-carbon adsorbent	Solvothermal treatment at 150 °C	natural RB19 aqueous solution at 25 °C	116.01 mg/g	**This word**

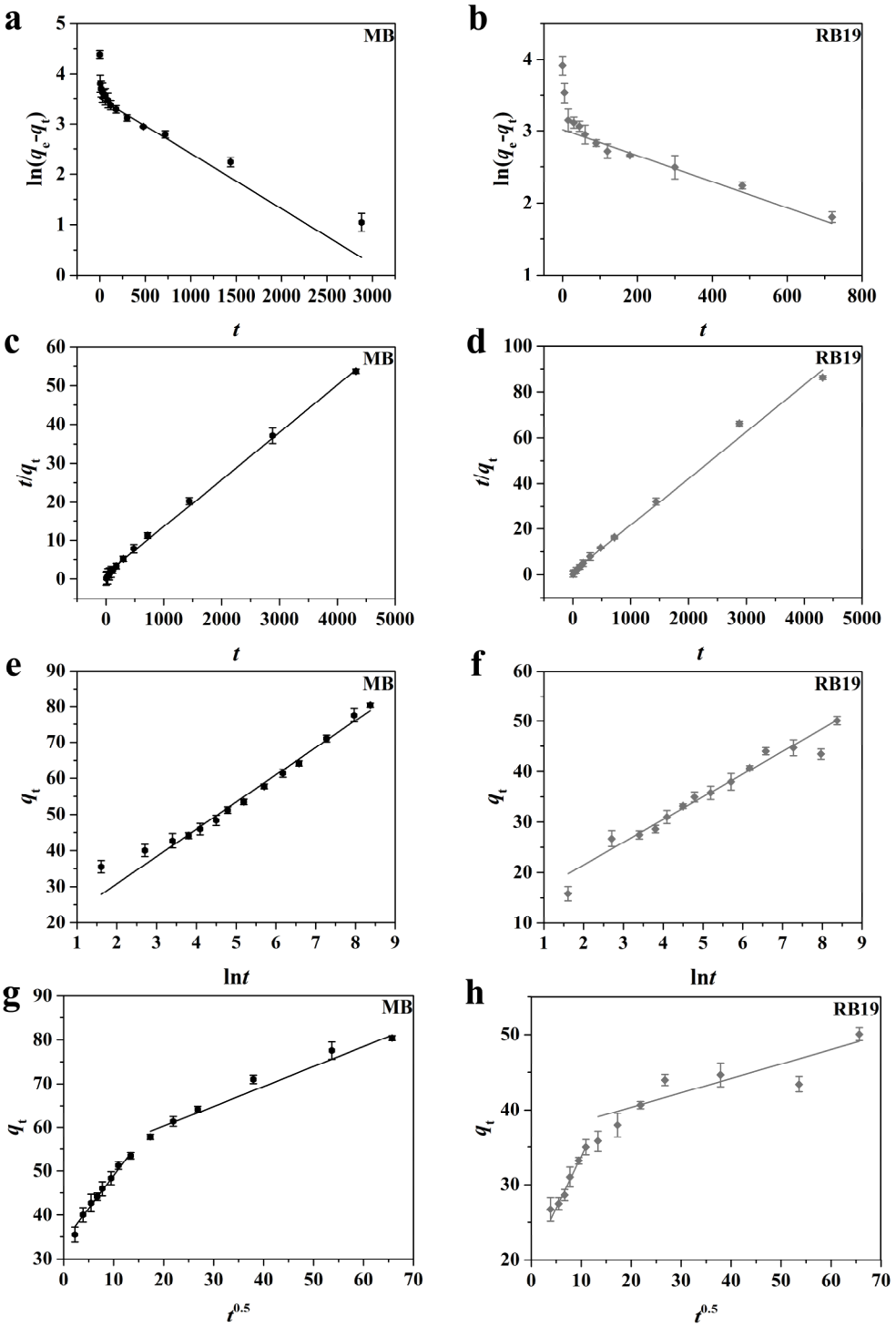

Figure S3. Kinetic curves for MB and RB dyes onto N-CMs (linear fitting): (**a**,**b**) Pseudo-first order kinetic fitted plot, (**c**,**d**) Pseudo-second order kinetic fitted plot, (**e**,**f**) Elovich model, and (**g**,**h**) Intra-particle diffusion model.

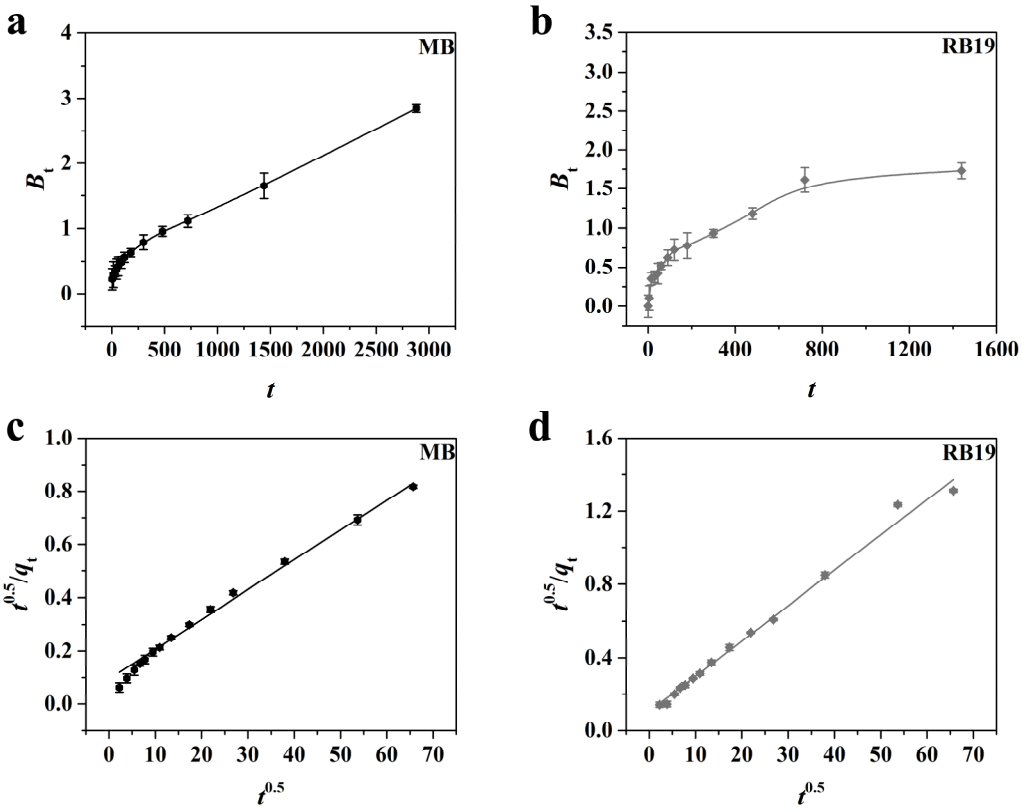

Figure S4. Boyd plots for (**a**) MB and (**b**) RB dye adsorption, and the linearly fitted diffusion-chemisorption model for (**c**) MB and (**d**) dye adsorption.

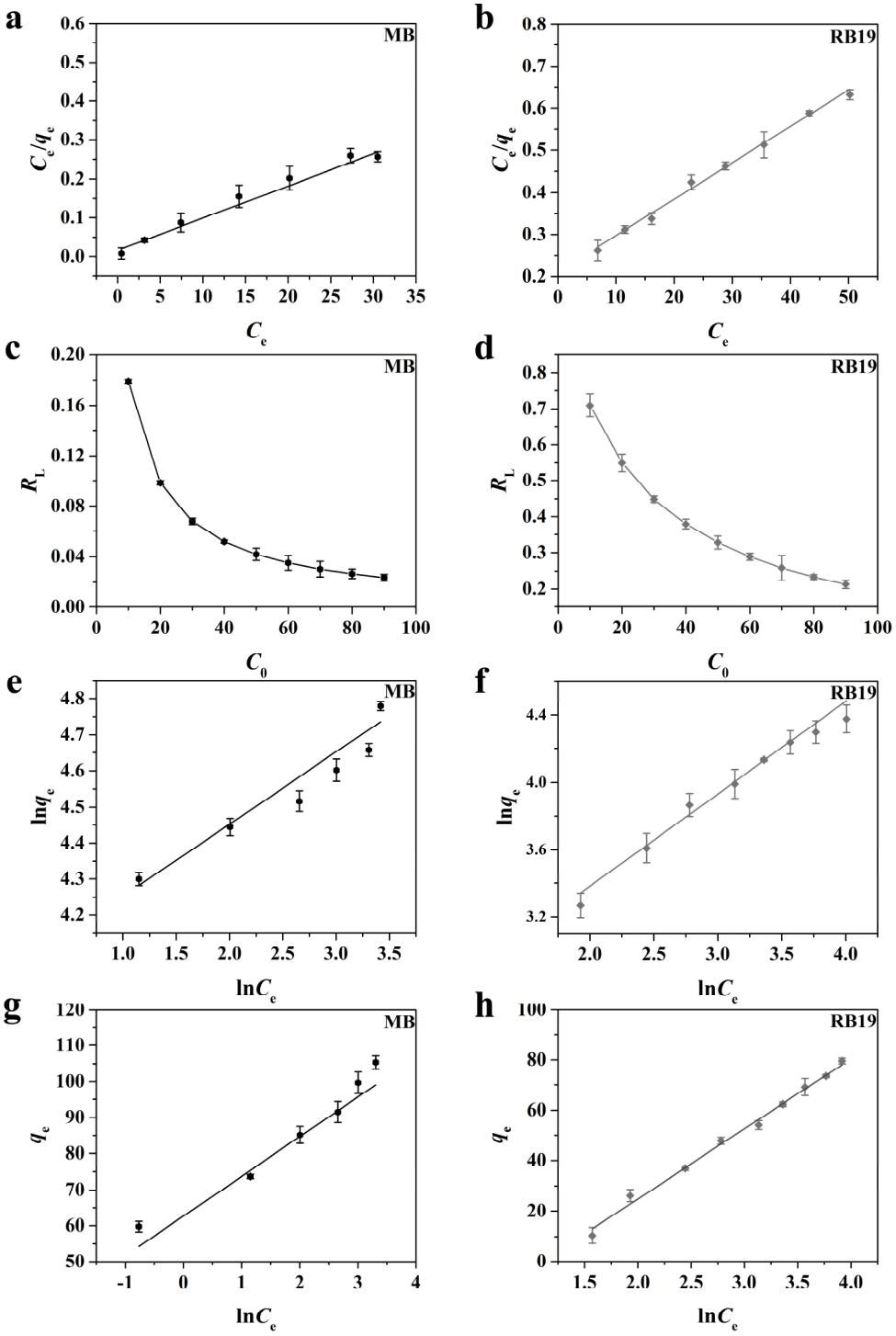

Figure S5. Adsorption isotherm curves for MB and RB dyes onto N-CMs: (**a**,**b**) Langmuir isotherm fitted plots (linear fitting), (**c**,**d**) plots of R_L with initial concentration, (**e**,**f**) Freundlich isotherm fitted plots (linear fitting), and (**g**,**h**) Temkin isotherm fitted plots (linear fitting).

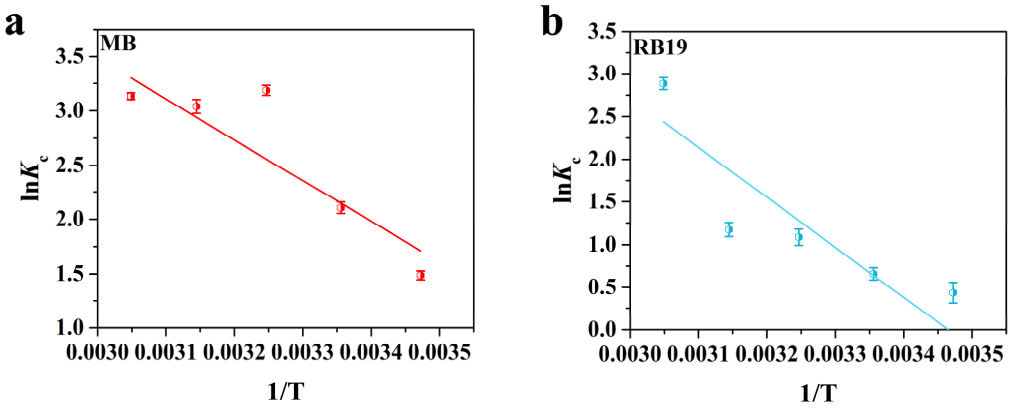

Figure S6. The plots of lnK_c verses 1/T for adsorption of (**a**) MB and (**b**) RB dyes onto N-CMs.

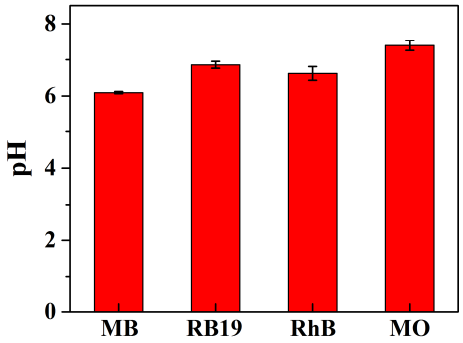

Figure S7. The pH of dye aqueous solution.

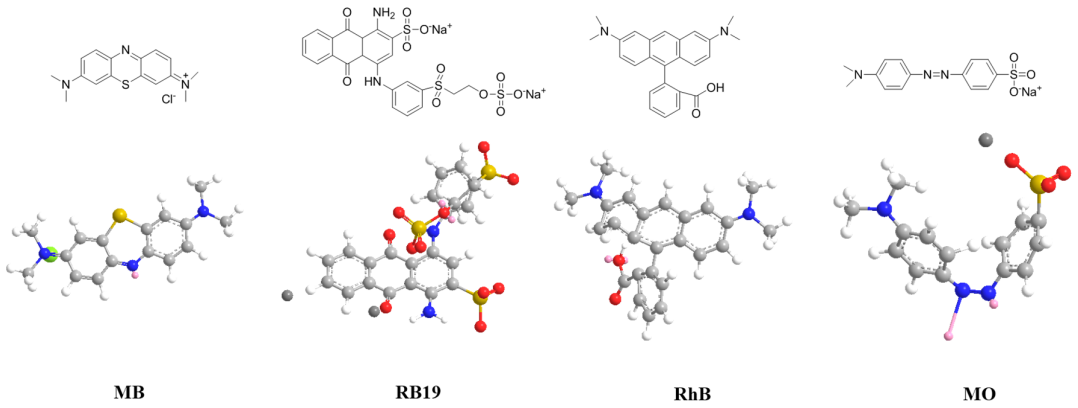

Figure S8. The structures of MB, RB, RhB and MO dyes.

References

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