

**Fabrication of manganese dioxide/carbon/attapulgitite composites
derived from spent bleaching earth for adsorption of Pb(II) and
Brilliant green**

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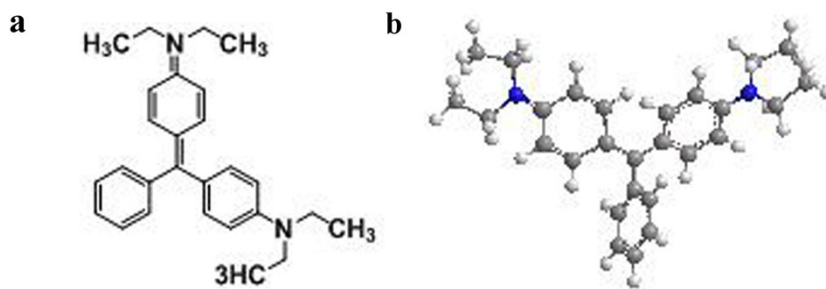


Fig. S1. (a) Molecular structure and (b) ball-stick model of BG.

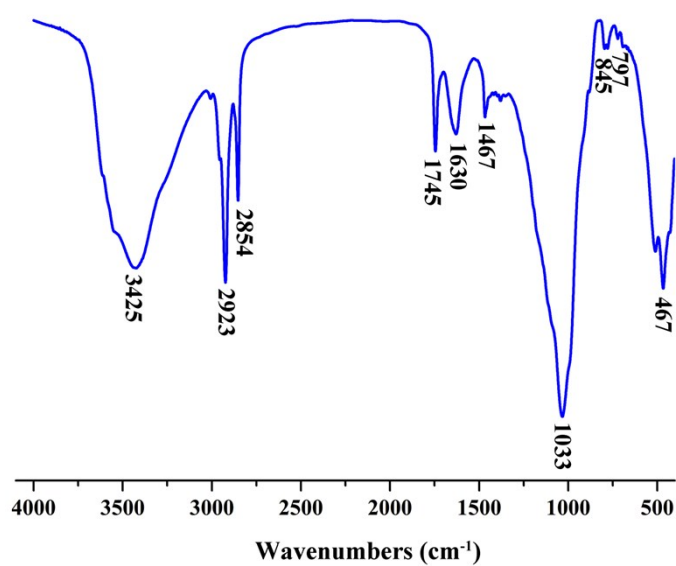


Fig. S2. FTIR spectrum of SBE.

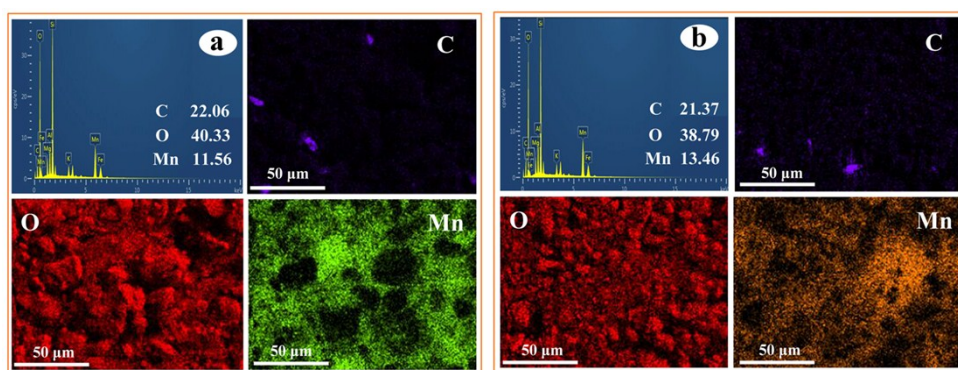


Fig. S3. EDS curves and element mapping images of (a) MCA₈ and (b) MCA₉, the inset show the atomic ratio of C, O and Mn.

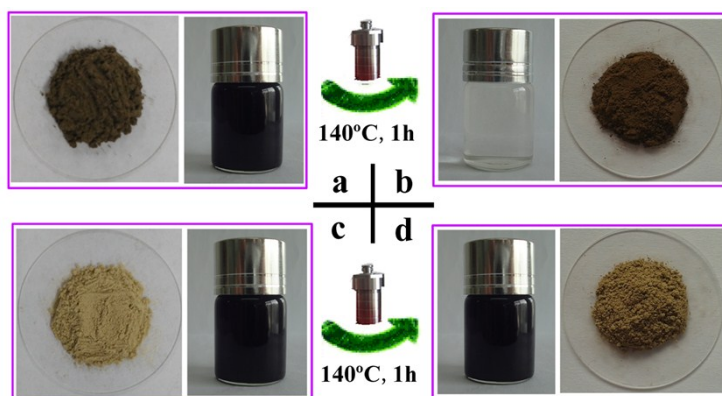


Fig. S4. Digital photographs of (a) SBE and reaction liquid before the hydrothermal reaction, (b) supernatant fluid and products after the hydrothermal reaction derived from SBE, (c) the bleaching earth and reaction liquid before the hydrothermal reaction, and (d) supernatant fluid and products after the hydrothermal reaction derived from the bleaching earth.

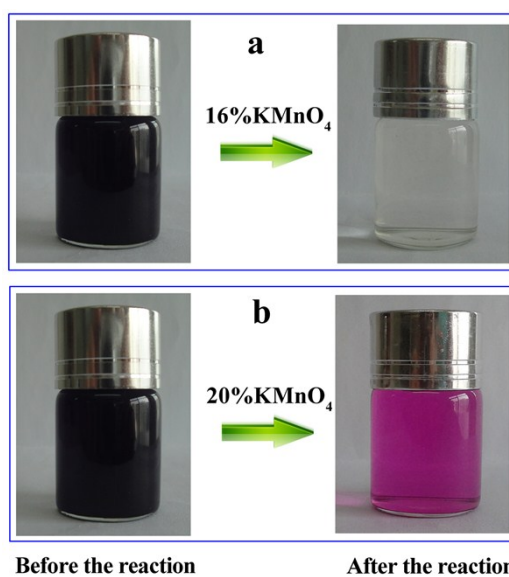


Fig. S5. Digital photographs of supernatant before and after hydrothermal reaction with the initial KMnO_4 concentration of (a) 16% and (b) 20%.

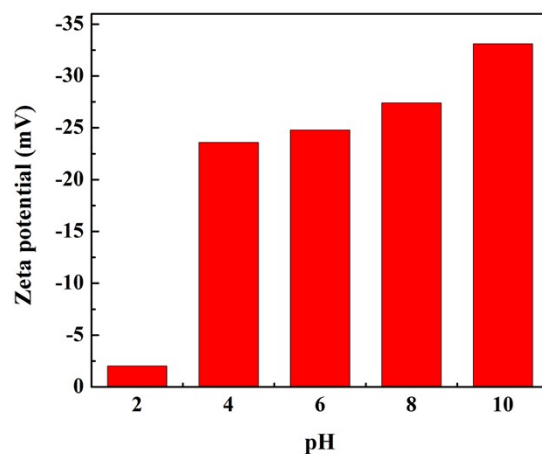


Fig. S6. Zeta potential of MCA₇ in the range of pH 2.0-10.0.

Table S1 N₂ adsorption/desorption analyses of CA, MCA₂, MCA₄, MCA₇ and MCA₉.

Sample	S_{BET}^a (m ² g ⁻¹)	S_{ext}^b (m ² g ⁻¹)	V_{tot}^c (cm ³ g ⁻¹)	D_{pore}^d (nm)
SBE	2.3	3.5	0.0027	3.85
CA	46.9	53.1	0.1991	16.95
MCA ₂	66.1	90.5	0.2319	14.03
MCA ₄	48.3	53.9	0.2056	17.03
MCA ₇	65.9	76.1	0.2655	16.11
MCA ₉	94.6	104.6	0.3303	13.96

^a BET (Brunauer–Emmett–Teller) surface area. ^b External surface area, calculated using *t*-plot method. ^c Total pore volume, measured at P/P₀ = 0.974. ^d Average pore diameter, calculated by $D_{\text{pore}} = 4 V/A$ according to BET.