Supporting information

Highly effective removal of Hg(II) solution using corn bract@MoS$_2$

as a new biomass adsorbent

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Materials and instruments

CB come from farmers’ markets; Ammonium molybdate tetrahydrate solution (AR 20%) and thiourea were purchased from Tianjin Daomao Chemical Reagent Company (Tianjin, China); Mercurium nitrate was supplied by Guizhou Tongren Tailuiier Chemical Plant (Guizhou, China). FT-IR spectrum was recorded on the PerkinElmer spectrum One (B) spectrometer using KBr particles in the range of 4000-500 cm$^{-1}$. Using the Bruker D8 device, X-ray powder diffraction (XRD) spectrum of the Cu-K$_\alpha$ radiation (λ=1.54a) sample under 40kv and 40ma was obtained in the range of 1~10°(2θ). The morphology of the sample was observed with a scanning
electron microscope (SEM, JEOL-6500F). Using Netzsch 209C under N2 flow conditions, the heating rate is 20 °C min⁻¹ to perform thermogravimetric analysis (TGA) on the stability of the sample. X-ray photoelectron spectroscopy (XPS) used ESCALAB250 to detect the surface composition of the sample.

![Figure S1 TEM images of CB@MoS₂ (a,b)](image)

Table S1 Langmuir and Freundlich isotherm parameters

| Models     | Parameters | value  |
|------------|------------|--------|
| Langmuir   | \( Q_{m,\text{cal}} \) (mg/g) | 990.10 |
|            | \( K_L \) (min⁻¹) | 0.2583 |
|            | \( R^2 \) | 0.9992 |
|            | ln\( K_F \) | 6.0181 |
| Freundlich | \( n \) | 5.4177 |
|            | \( R^2 \) | 0.9088 |
### Table S2 Pseudo-first-order, pseudo-second-order and intraparticle diffusion model parameters

| Models                      | Parameters               | value   |
|-----------------------------|--------------------------|---------|
| Pseudo-first-order equation | $Q_{e, \text{exp}}$ (mg/g) | 332.50  |
|                            | $Q_{e, \text{cal}}$ (mg/g) | 295.75  |
|                            | $k_1$ (min$^{-1}$)       | 0.0659  |
|                            | $R^2$                    | 0.8281  |
| Pseudo-second-order equation| $k_2$ (g·mg$^{-1}$·min$^{-1}$) | 0.0006  |
|                            | $R^2$                    | 0.9991  |
|                            | $k_{p1}$ (mg·g$^{-1}$·min$^{-0.5}$) | 45.104  |
|                            | $C_1$                    | 80.156  |
|                            | $R^2_1$                  | 0.9762  |
|                            | $K_{p2}$ (mg·g$^{-1}$·min$^{-0.5}$) | 13.627  |
| Intraparticle diffusion     | $C_2$                    | 200.34  |
|                            | $R^2_2$                  | 0.9630  |
|                            | $K_{p3}$ (mg·g$^{-1}$·min$^{-0.5}$) | 2.5264  |
|                            | $C_3$                    | 302.03  |
|                            | $R^2_3$                  | 0.5639  |

### Table S3 Thermodynamic parameters at different temperatures

| T(K) | 298  | 308  | 318  | 328  |
|------|------|------|------|------|
| ΔG(kJ/mol) | -6.69 | -10.00 | -13.32 | -16.64 |

Notes: $\Delta H^0$ = 92.108 kJ/mol, $\Delta S^0$ = 331.534 J/mol
Figure S2 (a) FT-IR spectra of CB@MoS₂ and CB@MoS₂@HgS; (b) XRD patterns of CB@MoS₂ and CB@MoS₂@HgS; (c) High-resolution XPS spectrum of Mo3d