

Calculations of the porosity data

Nitrogen adsorption/desorption measurements were carried out at -196 °C with a Micrometitics ASAP 2020 static volumetric analyzer. All the adsorption data about the porosity of the prepared carbons, including the BET surface area, pore volume, and pore size distribution derived from different models, are given by the workstation of ASAP200 analyzer. The pore size distribution was obtained from the adsorption branch using the Non-Local Density Functional Theory (NLDFT), assuming a cylindrical pore shape. For this model, the isotherms were calculated using a combination of statistical thermodynamic NLDFT calculations and experimental isotherms for reference samples of montmorillonite.

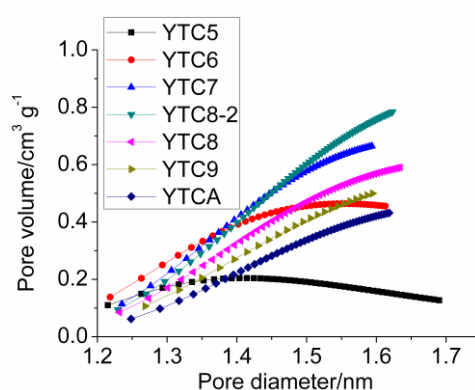


Fig. S1 The micropore size distribution calculated from the Dubinin-Astakhov model

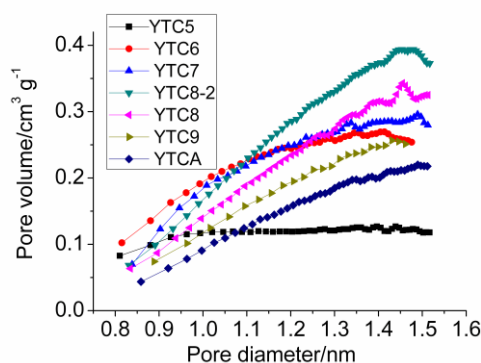


Fig. S2 The micropore size distribution calculated from the Horvath-Kawazoe model applying the Saito-Foley method

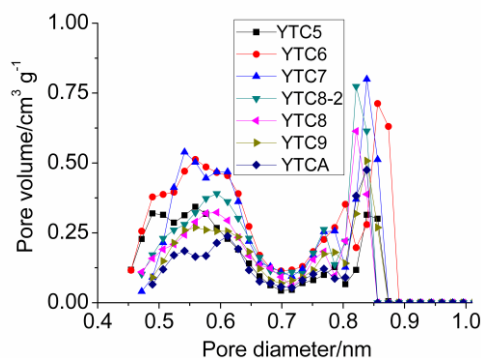


Fig. S3 The micropore size distribution calculated from the density functional theory

The correlation of adsorption isotherms

Three different models-Langmuir, Dubinin-Radushkevich (D-R) and Dubinin-Astakhov (D-A) models-have been used to analyze our experimental equilibrium data.

Langmuir Model. The well known Langmuir isotherm model can be expressed by equation 1.

$$\frac{Q}{Q_0} = \frac{bP}{1 + bP} \quad (1)$$

Where $Q/(\text{cm}^3 \text{ g}^{-1})$ is the amount adsorbed; $Q_0/(\text{cm}^3 \text{ g}^{-1})$ is the saturated amount adsorbed; P/kPa is the equilibrium pressure; and b/kPa^{-1} is the adsorption affinity.

A line expression for the Langmuir equation is

$$\frac{P}{Q} = \frac{1}{bQ_0} + \frac{1}{Q_0}P \quad (2)$$

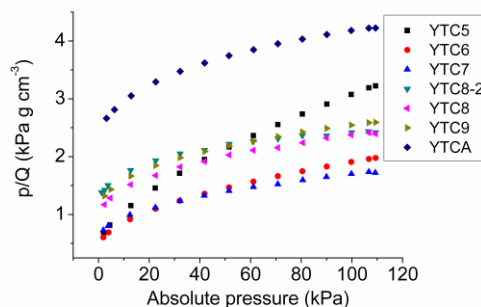


Fig. S4 The correlation of adsorption data with Langmuir equation

Fig. S4 showed the correlation of adsorption data with Langmuir equation. It could be clearly found that the Langmuir model could not define the CO_2 adsorption isotherms.

D-A and D-R models. The Dubinin-Astakhov model has been applied to the adsorption equilibria of several vapors and gases onto microporous activated carbons. The D-A equation is written as

$$W = W_0 \exp \left[- \left(\frac{A}{E} \right)^n \right] \quad (3)$$

$$\ln W = \ln W_0 - \left(\frac{A}{E}\right)^n \quad (4)$$

Where W is the volume adsorbed, W_0 is the limiting micropore volume, E is the characteristic energy of the system, n is the heterogeneity parameter, and A is the adsorption potential.

The adsorption potential A is given by

$$A = RT \ln\left(\frac{P_0}{P}\right) \quad (5)$$

Where R is the gas constant, T is the equilibrium temperature, and P_0 is the saturated pressure.

Then the D-A equation could be expressed as

$$\ln W = \ln W_0 - \left(\frac{RT}{E}\right)^n \ln^n\left(\frac{P_0}{P}\right) \quad (6)$$

$$\lg W = \ln W_0 - [2.303^{n-1} \left(\frac{RT}{E}\right)^n] \lg^n\left(\frac{P_0}{P}\right) \quad (7)$$

A plot of $\lg W$ versus $\lg^n\left(\frac{P_0}{P}\right)$ should give a straight line with a slope of $-[2.303^{n-1} \left(\frac{RT}{E}\right)^n]$

and a intercept of $\ln W_0$ if the adsorption isotherms fit well the D-A model.

The D-R equation is written as

$$W = W_0 \exp\left[-k\left(\frac{A}{\beta}\right)^2\right]$$

Where W is the volume adsorbed, W_0 is the limiting micropore volume, k is a constant about pore structure, β is affinity coefficient, and A is the adsorption potential.

Then a line expression of D-R equation could be also written as

$$\lg W = \ln W_0 - [2.303k \left(\frac{RT}{\beta}\right)^2] \lg^2\left(\frac{P_0}{P}\right)$$

Actually, the D-A equation is equal to the D-R equation when the heterogeneity parameter, n , is equal to 2.

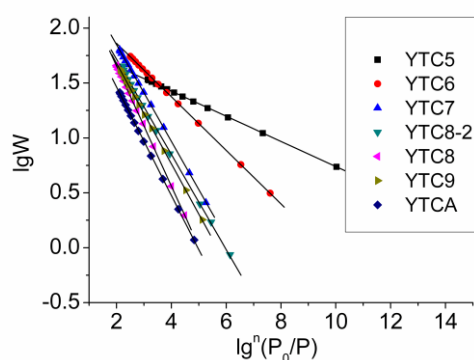


Fig. S5 The correlation of CO₂ adsorption data with D-A model

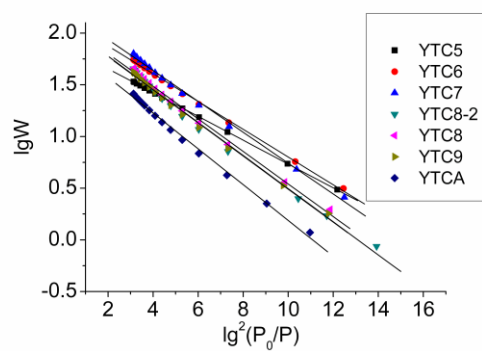


Fig. S6 The correlation of CO₂ adsorption data with D-R model

The analysis of isotherms data using D-A or D-R models is present in Fig. S5 and S6, respectively. It could be easily found that the experimental data can be well simulated by the D-A model.