

Figure S1. ^{13}C -NMR spectra of JC anthracite coal sample.

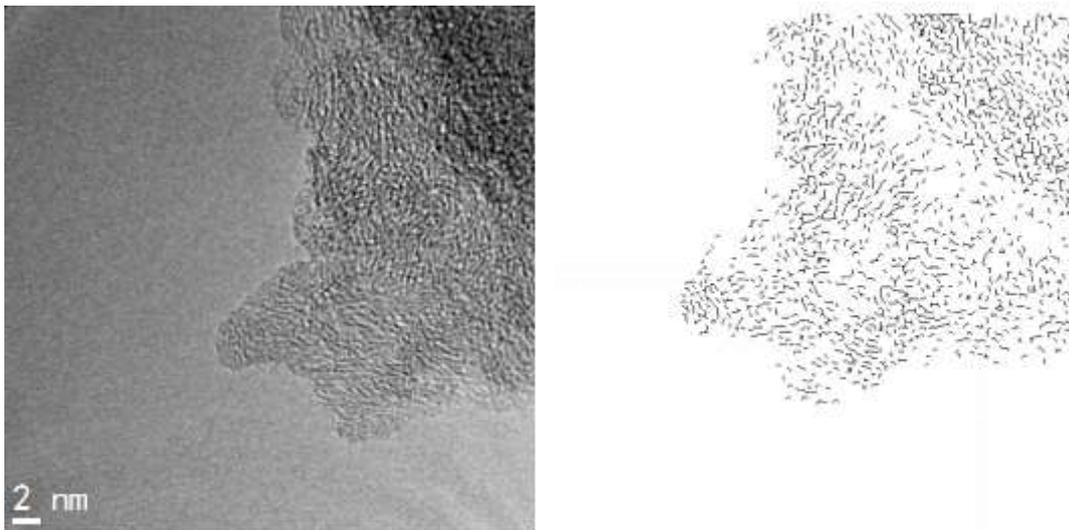


Figure S2. Diagram of image on lattice image of Jincheng anthracite coal.

Table S1. Structural assignment frequency obtained from lattice fringe data.

Grouping by Fringe Length Range	Naphthalene	Anthracene	2×2	3×3	4×4	5×5	6×6	7×7	8×8
Length/nm	<0.44	<0.59	5.9–9.9	1.0–1.49	1.5–1.99	2.0–2.49	2.50–2.99	3.0–3.49	3.5–3.99
Freq./%	1.6	2.6	45.5	26.2	12.5	6.9	3.1	0.6	1.0

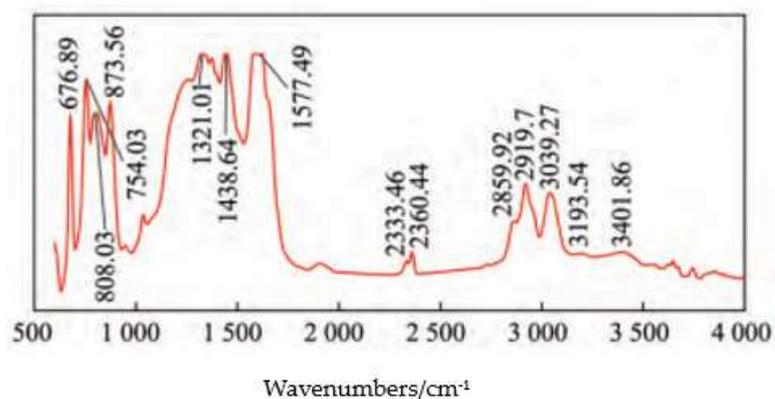


Figure S3. FTIR spectrum of JC anthracite coal sample.

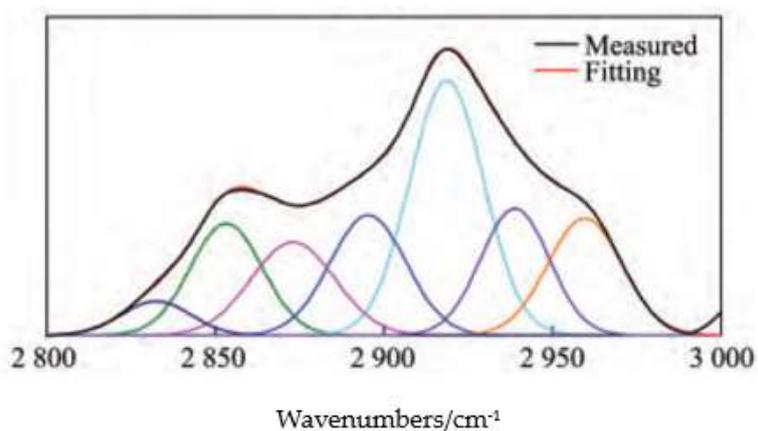
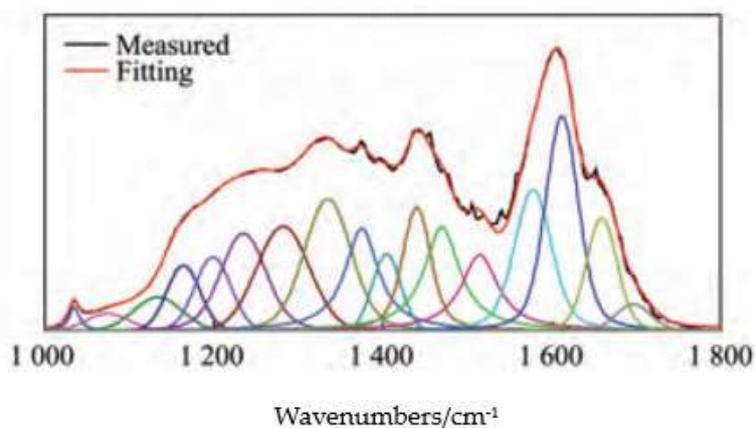
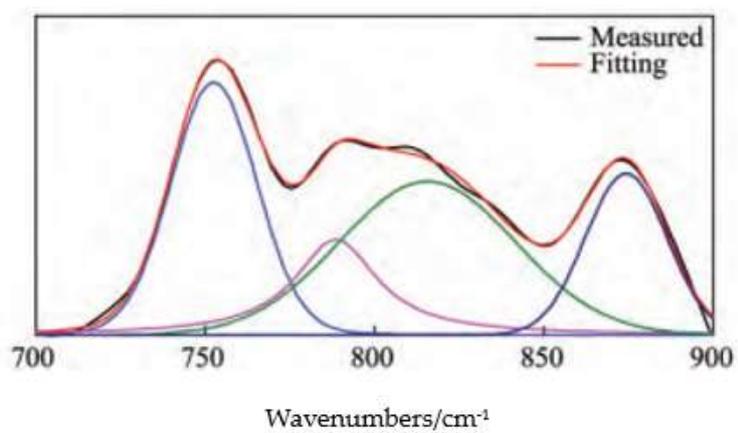


Figure S4. Curve-fitted spectrum in the 700–900, 1000–1800 and 2800–3000 cm⁻¹ zone of JC anthracite coal sample.

Table S2. XPS C(1s), N(1s) and S(2p) data of JC anthracite coal sample.

Element	Attribution	Peak information	
		Position	Relative content/%
C1s	Graphite and Aliphatic carbon	284.6	88.3
	Alcohol,phenol or ether	286.2	10.1
	Carbonyl group carbon	287.5	1.6
N1s	Pyridine nitrogen	398.1	21.7
	Pyrrole nitrogen	400.0	52.7
	Quaternary nitrogen	401.4	21.1
	Nitrogen Oxides	402.9	4.5
S2p _{3/2}	Sulfide	163.7	3.7
	Thiophenic	163.9	25.9
	Sulphoxide	165.7	9.7
	Sulphone	168.4	15.5
	Sulphate	170	11.9
S2p _{1/2}	Sulfide	164.5	1.9
	Thiophenic	165.0	13.0
	Sulphoxide	166.9	4.8
	Sulphone	169.6	7.7
	Sulphate	171.2	5.9