Electronic Supplementary Material (ESI) for Industrial Chemistry & Materials.

Support information

The specific pore analysis methods of activated carbon:

The BUILDER SSA-6000 aperture specific surface area analyzer (Beijing BJbuilder electronic technology Co. Ltd) was used to analyze the specific surface area and pore structures of the sample. Before the test, the samples were pretreated in vacuum for 2 h at 150°C to remove the physically adsorbed water and other adsorbents. The pore structures of the samples were measured with N_2 adsorption and desorption methods at 77 K. The pore size distribution and specific surface area of the materials were evaluated by the Brunauer-Emmett-Teller (BET) and the Barrett-Joyner-Halenda (BJH) method.

The specific calculated methods of microcrystalline parameters of activated carbon:

XRD characterization was measured on X-ray powder diffractometer (Ultima IV-2036E102, Japan) using Cu Kα radiation (λ = 1.54051 Å, 40 kV, 30 mA). Diffraction intensities were recorded in the angular range $10° \leq 2\theta \leq 80°$. The spectrum was corrected for polarization using standard procedure. Curve fitting was preformed using a Gaussian algorithm. Average structural parameters were calculated from the full width at half maximum (FWHM) and the peak positions (θ) using empirical expressions derived by Scherrer.

The interlayer spacing between aromatic sheets (d_{002}) was calculated from the peak position of (002) band using the Bragg equation:

$$d_{002}=\lambda/2\sin(\theta_{002}) \tag{S1}$$

The average crystallite stacking height (Lc) and diameter (La) were calculated from the FWHM and peak locations of (002) and (100) peaks:

$$Lc=0.89\times\lambda/\beta_{002}\times Cos(\theta_{002}) \tag{S2}$$

$$La=1.84\times\lambda/\beta_{100}\times Cos(\theta1_{00}) \tag{S3}$$

Where the λ is the wavelength of the incident X-ray beam (0.15406 Å).

The specific ash content testing methods of activated carbon:

According to the guidelines of the American Society for Testing and Materials (ASTM D 3172 -1989). The test method for ash content in the sample was as follows: ca. 1.0 g of the dried samples was accurately weighed and the samples and were calcinated at 250 ºC for 1 h and then heated at 550 ºC for 2 h with a heating rate of 5 ºC/min in air. The ash content was calculated via the Equation S4.

$$Ash\% = \frac{M_l}{M_0} * 100\% \tag{S4}$$

M_l means the mass of sample after treatment; M_0 means the mass of sample before treatment

Table S1 The normalized abundance of the light organics in bio-oil from the pyrolysis and activation of polyaniline, bio-oil and $K_2C_2O_4$ mixed with different ratio at 800 °C

Organics	**Compounds**	**Relative abundance to Methyl myristate (%)**	
		P1B1	**P1B1-K3**
Ketones	**4-Cyclopentene-1,3-dione**	**4.3**	**0**
	1,2-Cyclopentanedione, 3-methyl-	**2.9**	**0**
	2-Cyclopenten-1-one, 3-methyl-	**0**	**0.9**
Phenols	**Phenol, 2-methoxy-**	**29.3**	**10.1**
	Phenol	**461.8**	**70.8**
	p-Cresol	**0**	**15.8**
	Phenol, 2-methoxy-4-methyl-	**60.4**	**7.9**
	Phenol, 2,3,5-trimethyl-	**0**	**0.8**
	Phenol, 4-ethyl-2-methoxy-	**90.9**	**0**
	Phenol, 4-ethyl-	**0**	**6.3**
	Phenol, 2,6-dimethyl-	**0**	**12.6**
	Phenol, 2-methoxy-4-(1-propenyl)-, (Z)-	**0**	**2.0**
	Phenol, 2,4-dimethyl-	**5.8**	**3.3**
	Phenol, 3,4-dimethyl-, methylcarbamate	**0**	**1.9**
	Phenol, 3,4-dimethyl-	**43.7**	**8.5**
	Phenol, 2,6-dimethoxy-	**64.1**	**0**
	3,5-Dimethoxy-4-hydroxytoluene	**36.9**	**10.0**

	Phenol, 2-methyl-	0	12.1
	Phenol, 4-methoxy-3-methyl-	0	0.8
	Benzene, 1,2,3-trimethoxy-5-methyl-	48.8	8.7
	Benzaldehyde	7.0	0
Nitrogens	Aniline	127.4	47.9
	Benzenamine, 3-methyl-	2.2	0
	p-Aminotoluene	2.7	0
	Benzonitrile, 2-hydroxy-	15.0	0
	Diphenylamine	63.5	65.2
	Benzenamine, 4-methyl-N-phenyl-	13.3	4.1
	Salacetamide	20.8	0
	5H-Indeno[1,2-b]pyridine	12.4	0
	D-Galactitol, 2-(acetylmethylamino)-2-deoxy-3,4,6-tri-O-methyl-, 1,5-diacetate	0	2.2
	Phenazine	0	1.2
	Phenanthridine	0	1.6
Benzenes	2,3-Dimethoxytoluene	3.3	0
	Retene	15.6	0
	Methyl dehydroabietate	12.3	7.8
	Styrene	6.2	0

Table S2 The microcrystalline structure parameters of the biochar and activated carbon from the pyrolysis and activation of polyaniline, bio-oil and $K_2C_2O_4$ mixed with different ratio at 800 °C

Entry	**Samples**[a]	**FWHM**[b]		**d_{002}**[c] **(nm)**	**Lc_{002}**[d] **(nm)**	**La_{100}**[e] **(nm)**
		C (0 0 2)	**C (1 0 0)**			
1	**Biochar-P1B1**	8.13	5.33	0.3961	0.01719	0.05728
2	**AC-P1-K3**	11.45	8.38	0.4055	0.01219	0.03628
3	**AC-B1-K3**	11.66	10.19	0.3959	0.01199	0.02978
4	**AC-P1B1-K3**	7.05	7.63	0.4348	0.01977	0.03993
5	**AC-(P1B1)-K2**	6.80	6.53	0.4409	0.02047	0.04659
6	**AC-(P2B1)-K2**	8.10	8.70	0.4081	0.01723	0.03495
7	**AC-(P1B2)-K2**	6.91	6.85	0.4344	0.02015	0.04447

[a] All samples were pickled with sulfuric acid

[b] FWHM: Full width at half maximum;

[c] d: Interlayer spacing of biochar;

[d] L_c: Crystallite stacking height of biochar;

[e] L_a: Transverse size of biochar.

Table S3 The conversion of O-Chloronitrobenzene over the Ni/AC catalysts[a]

Entry	**Catalysts**	**Con. (%)**	**Yield (%)**	
			o-chloroaniline	Aniline
1	**Biochar-P1B1**	100.0	98.1	1.9
2	**AC-P1-K3**	99.8	92.2	7.5
3	**AC-B1-K3**	100.0	92.8	7.2
4	**AC-P1B1-K3**	99.8	95.5	4.4
5	**AC-(P1B1)-K2**	99.6	81.6	18.0
6	**AC-(P2B1)-K2**	100.0	84.9	15.1
7	**AC-(P1B2)-K2**	99.7	83.3	14.8

[a] Reaction conditions: T = 170ºC; t = 2 h; P_{H2} = 4 MPa (at room temperature); stirring speed = 600 rpm; catalyst loading: 40 mg; reactant loading: 0.1 g; isopropanol: 3.9 g.

Table S4 The conversion of vanillin over the Ni/AC catalysts[a]

Entry	**Catalysts**	**Con. (%)**	**Yield (%)**	
			2-methoxy-4-methylphenol	4-(ethoxymethyl)-2-methoxyphenol
1	**Biochar-P1B1**	55.9	21.3	23.8
2	**AC-P1-K3**	100.0	98.1	0
3	**AC-B1-K3**	100.0	100.0	0
4	**AC-P1B1-K3**	100.0	89.1	0
5	**AC-(P1B1)-K2**	100.0	98.2	0
6	**AC-(P2B1)-K2**	100.0	93.3	0
7	**AC-(P1B2)-K2**	100.0	93.1	0

[a]Reaction conditions: T = 170ºC; t = 2 h; P_{H2} = 4 MPa (at room temperature); stirring speed = 600 rpm; catalyst loading: 40 mg; reactant loading: 0.1 g; ethanol: 3.9 g.

Table S5 The main chemicals used in the experiment and their corresponding purities

Chemicals	**Purity (≥ %)**
Sulfuric acid	98.0
Ethanol	99.7
Zinc chloride	98.0
Potassium oxalate	99.8
Sodium hydroxide	96.0

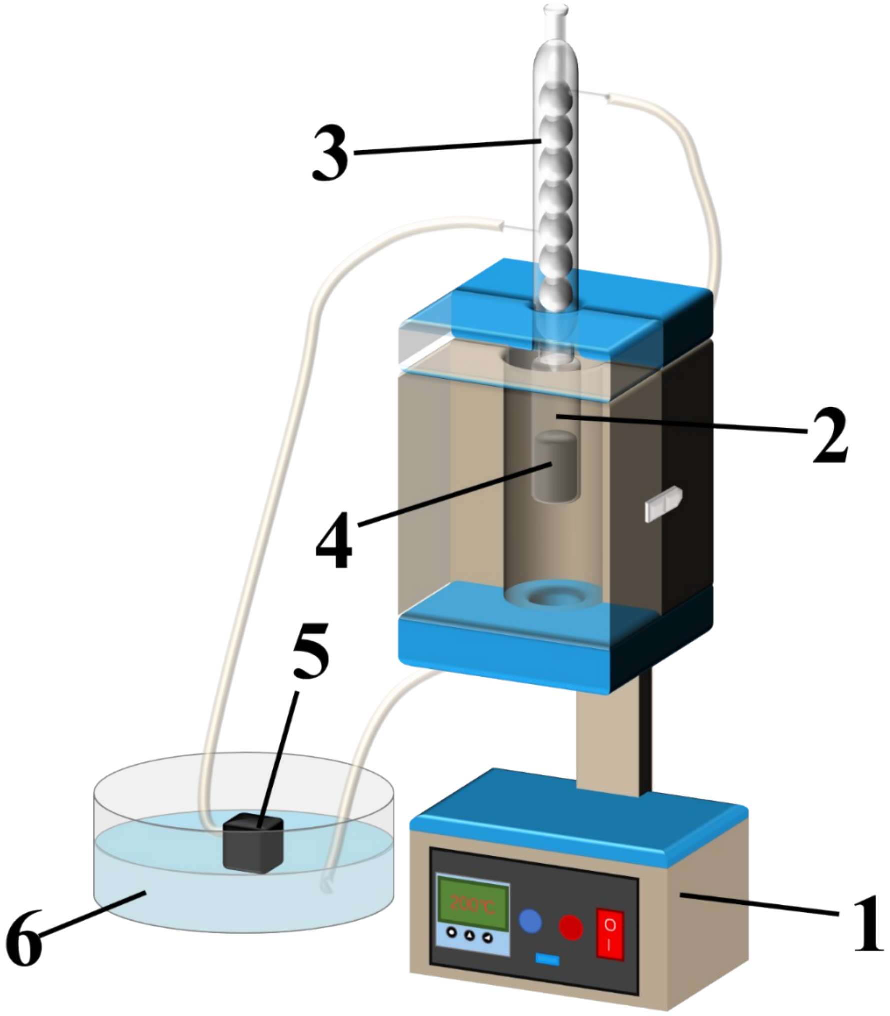

Fig. S1 The schematic rig for the pre-polymerization experiments. 1. Vertical furnace; 2. Quartz flask; 3. Condenser; 4. Polymer; 5. Water pump; 6. Ice water.

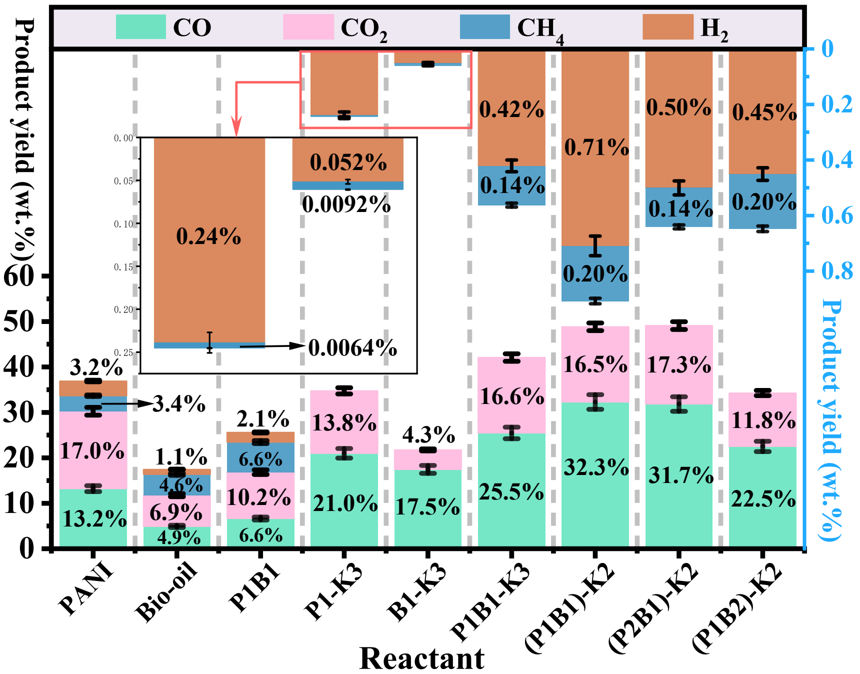

Fig. S2 The gaseous yields from the activation of polyaniline, bio-oil and $K_2C_2O_4$ mixed with different ratio at 800 °C. (The nitrogen-containing gas could not be identified, and thus the gas yields showed herein was calculated on the assumption that all the gases produced were CO, CO_2, CH_4 and H_2)

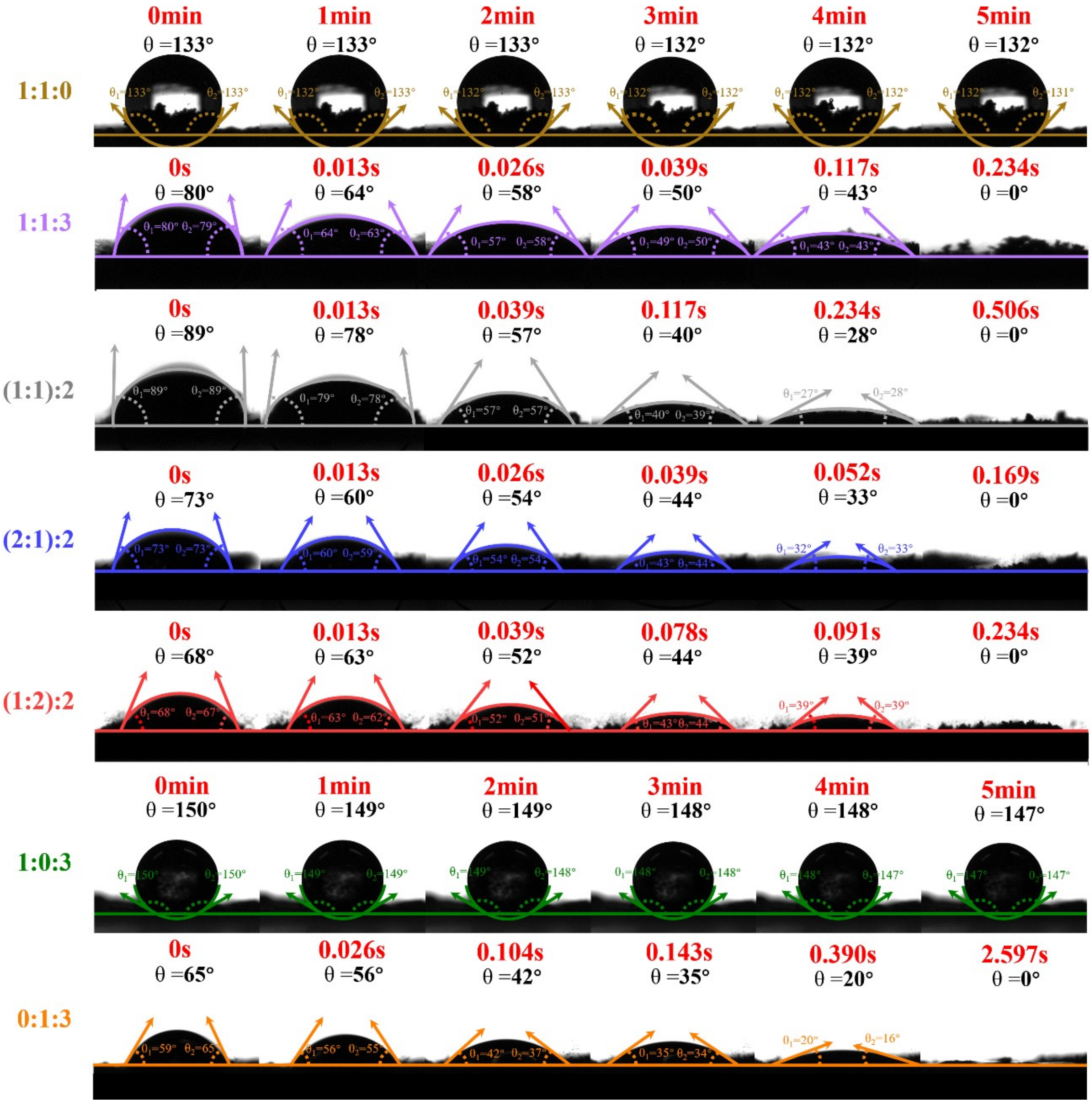

Fig. S3 Contact angle characterization of the biochar/activated carbon produced from the activation of polyaniline, bio-oil or their mixture of different mass ratios at 800°C.

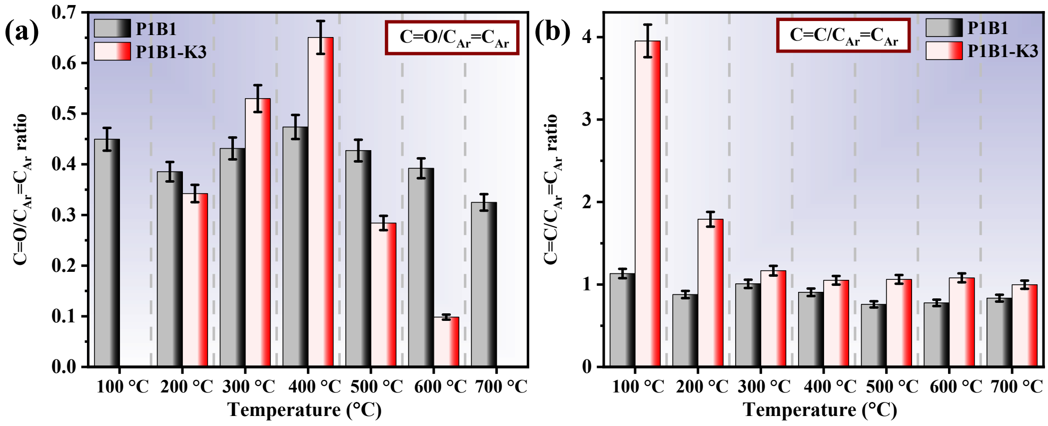

Fig. S4 The abundance ratio of the functionalities in the DRIFTS characterization of feedstocks. (a): The ratio of C=O/C=C in aromatic; (b): The ratio of C=C in alkene/ C=C in aromatic.

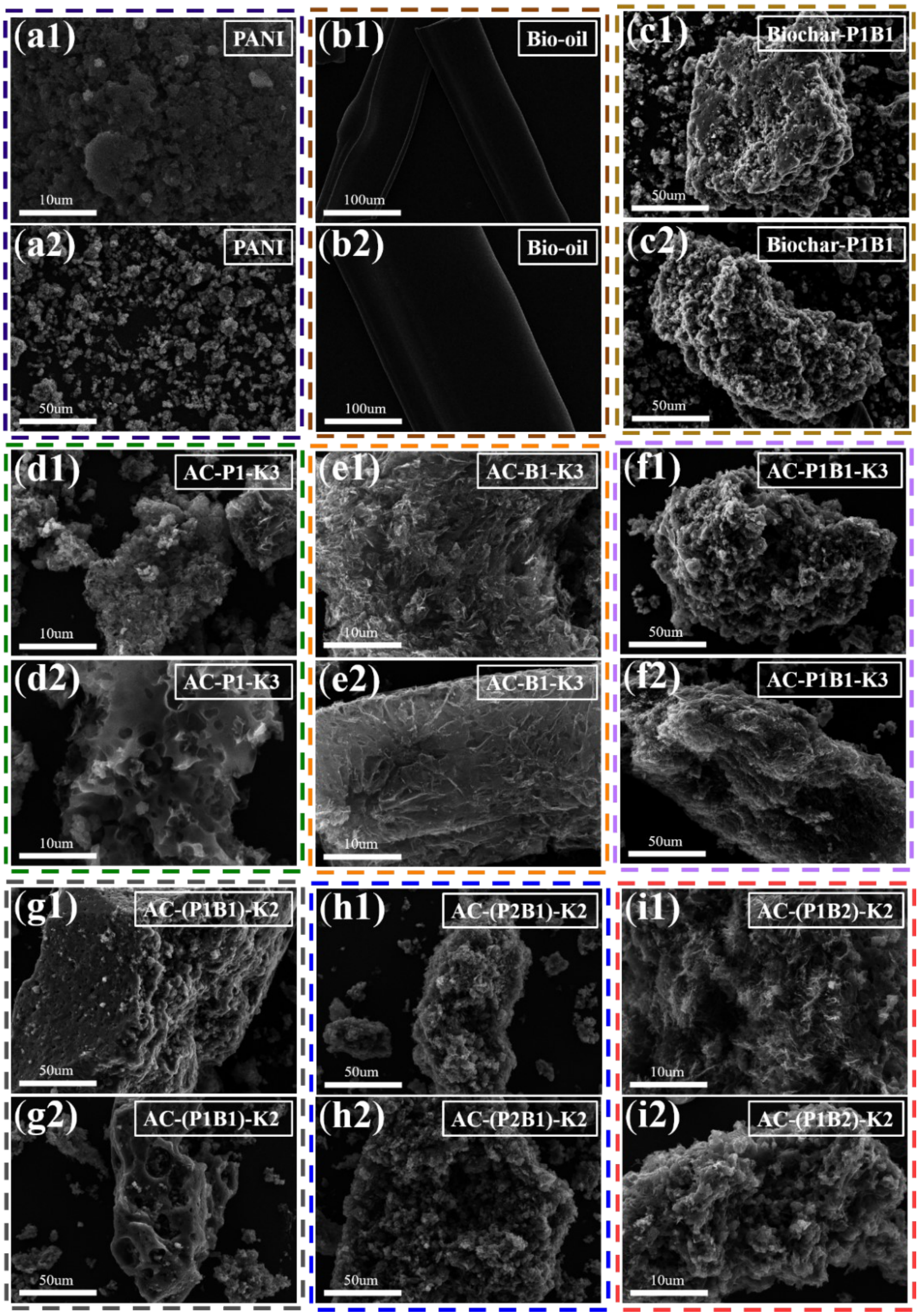

Fig. S5 SEM characterization of the feedstock, the biochar and activated carbon produced from the activation of polyaniline, bio-oil or their mixture of different mass ratios at 800°C; (a1-a2): polyaniline; (b1-b2): bio-oil; (c1-c2): Biochar-P1B1; (d1-d2): AC-P1-K3; (e1-e3): AC-B1-K3; (f1-f2): AC-P1B1-K3; (g1-g2): AC-(P1B1)-K2; (h1-h2): AC-(P2B1)-K2; (i1-i2): AC-(P1B2)-K2.