Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.
This journal is © the Owner Societies 2024

# Support information

# Enhanced supercapacitor performance of porous carbon through tuning maceral composition proportion of coal

Ruirui Zhao [a], Jian Hao*[a], Xiao Yang [a], Ruyi Zhang [a], Caixia Chi [b], Hui Zhang [a], Qingjie Guo [a]

[a.]*State Key Laboratory of High-efficiency Utilization of Coal and Green Chemical Engineering, College of Chemistry & Chemical Engineering, Ningxia University, Yinchuan 750021, China E-mail: haojian2017@126.com.*
[b]*Heilongjiang Province Key Laboratory of Environmental Catalysis and Energy Storage Materials Suihua 152061, China.*

Experimental:

Analysis of pyrolysis gas: Use gas chromatography to identify the gas production. A gas pyrolysis collector was attached to the rear of the tube furnace. Then the tube furnace was heated at 400, 600, 800, and 900°C, respectively with 10 min. When the pyrolysis gas reached stability, a 1 L new gas sampling bag was used to collect the pyrolysis gas from the end of the furnace and immediately injected into gas chromatography to analyse the gas composition and content. The gas chromatography analysis was carried out using a FID and TCD, (Agilent GC8860，Agilent Technologies (China), (Beijing, China) ), using a PQ Methane Column (2.5 m × 0.2 mm × 0.2 μm), held at 363 K for 600 s before rising to 623 K. Qualitative examination was grounded in the retention time of each component in the sample (peak position), while quantitative assessment leaned on the response values (peak area) for each component in the sample.

Table S1 The summary of the yield of materials.

| Sample | Yield |
|---|---|
| PC-Coal | 28.12 % |
| PC-MHJ.V | 30.12 % |
| PC-MHJ.I | 27.63 % |
| PC-3:1 | 29.52 % |
| PC-2:1 | 29.13 % |
| PC-1:1 | 28.42 % |
| PC-1:2 | 28.33 % |
| PC-1:3 | 28.01 % |
| PC-750-40 | 34.67 % |
| PC-800-40 | 32.55 % |
| PC-850-40 | 31.03 % |

| | |
|---|---|
| PC-900-40 | 28.33 % |
| PC-950-40 | 20.22 % |
| PC-900-20 | 35.79 % |
| PC-900-40 | 28.33 % |
| PC-900-60 | 25.57 % |
| PC-900-90 | 20.06 % |
| PC-900-120 | 18.84 % |

Table S2 The summary of specific capacitance for the different materials.

| Precursor | Activation agent | Test system | Electrolyte | Capacitance ($F \cdot g^{-1}$ / $A \cdot g^{-1}$) | Ref |
|---|---|---|---|---|---|
| Xinjiang anthracite | $ZnCl_2$ | Three electrode | 6 M KOH | 178/0.5 | [1] |
| Lignite | $ZnCl_2$ | Three electrode | 6 M KOH | 207/0.5 | [2] |
| Coal | PVA | Three electrode | 6 M KOH | 260/0.5 | [3] |
| Zhundong coal | $FeCl_3$+$CO_2$ | Three electrode | 6 M KOH | 206/0.5 | [4] |
| Taixi anthracite | $CO_2$+KOH | Three electrode | 6 M KOH | 211/1.0 | [5] |
| almonds | KOH | Three electrode | 6M KOH | 228/1.0 | [6] |
| zanthoxylum Leaves | $ZnCl_2$ | Three electrode | 2 M KOH | 196/0.5 | [7] |
| poplar fruit | KOH | Three electrode | 6 M KOH | 58/0.5 | [8] |
| Jinglong coal | KOH+H2O | Three electrode | 6 M KOH | 183/0.5 | [9] |
| Miehuajing coal | KOH | Three electrode | 6 M KOH | 229/1.0 | This work |

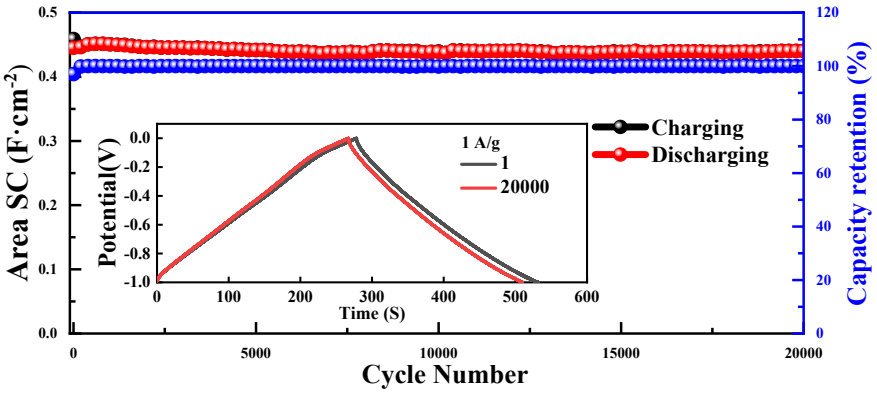


Fig.S1 The area capacity of PC-900-40 in 2000 cycles.

## References


1. L. Wang, R. Wang, H. Zhao, L. Liu and D. Jia, *Mater. Lett.*, 2015, **149**, 85-88.
2. L. Li, X. Wang, S. Wang, Z. Cao, Z. Wu, H. Wang, Y. Gao and J. Liu, *Electroanalysis*, 2016, **28**, 243-248.
3. Y. Lv, L. Ding, X. Wu, N. Guo, J. Guo, S. Hou, F. Tong, D. Jia and H. Zhang, *Scientific Reports*, 2020, **10**, 7022.
4. L. Wang, F. Sun, J. Gao, X. Pi, T. Pei, Z. Qie, G. Zhao and Y. Qin, *Journal of the Taiwan Institute of Chemical Engineers*, 2018, **91**, 588-596.
5. X.-M. Yue, Z.-Y. An, M. Ye, Z.-J. Liu, C.-C. Xiao, Y. Huang, Y.-J. Han, S.-Q. Zhang and J.-S. Zhu, *Molecules*, 2019, **24**, 101970.
6. F. Zeng, Z. Li, X. Li, J. Wang, Z. Kong, Y. Sun, Z. Liu and H. Feng, *Applied Surface Science*, 2019, **467**, 229-235.
7. Y. Xu, H. Lei, S. Qi, F. Ren, H. Peng, F. Wang, L. Li, W. Zhang and G. Ma, *J. Energy Storage*, 2020, **32**, 101970.
8. T. R. Kumar, R. A. Senthil, Z. Pan, J. Pan and Y. Sun, *J. Energy Storage*, 2020, **32**, 101903.
9. D. Dong, Y. Zhang, T. Wang, J. Wang, C. E. Romero and W.-p. Pan, *Materials Chemistry and Physics*, 2020, **252**, 123381.