# Supporting Information

**Low-temperature synthesis of high-purity boron carbide via an aromatic polymer precursor**

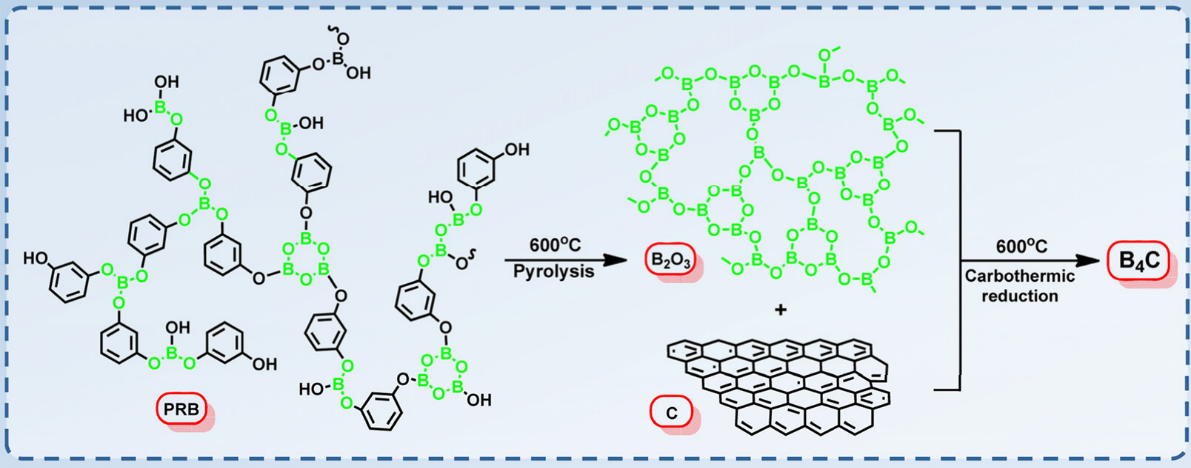
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# Characterization

Nitrogen adsorption/desorption isotherms were measured at 77 K using an ASAP 2020 Micromeritics Instrument. The BET surface areas of samples were calculated from the adsorption data using the Brunauer-Emmett-Teller (BET) method. The pore size distributions were derived from the adsorption branches of the isotherms using BJH (Barrett-Joyner-Halenda) method.



**SCHEME S1**. The possible synthesis process of the B4C.

**TABLE SI.** The percentage areas of the deconvoluted signals obtained from the XPS spectra of

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PRB. |  | | | |
|  |  |  | Functional |  |
| Polymer | Component | Binding energy (eV) |  | % of total area |
|  |  |  | groups |  |
|  |  | 284.68 | C–C | 62.37 |
|  | C | 286.28 | C–O | 19.82 |
| PRB |  | 288.33 | O–C=O | 17.81 |
|  |  | 194.7 | B–OH | 12.23 |
|  | B | 192.3 | B–O–B | 19.36 |
|  |  | 190.9 | B–O | 68.41 |

**TABLE SII.** Thermal characteristics of PRB from TGA results.

a b c o d

Weight loss (%)

T5%

T10%

Tmax

R800 C

Polymer

(oC)

(oC)

(oC)

(%)

First stage (200-450 oC)

Second stage (450-700 oC)

Third stage (700-800 oC)

PRB 226 311 440 69.0 5.24 10.75 1.77

a Thermal decomposition temperature at 5% weight loss.

b Thermal decomposition temperature at 10% weight loss.

c The temperature of the maximum degradation rate.

d Residue weight at 800 oC.

**TABLE SIII.** The percentage areas of the deconvoluted signals obtained from the XPS spectra

of the carbonized products of PRB.

Polymer Component Binding energy (eV) Functional groups % of total area

283.51 C–B 12.54

C

600 oC/2 h

284.48 C–C 68.69

285.28 C–H 9.51

286.50 C–O 9.25

192.18 B–O–B 7.70

B 190.48 B–O 81.95

189.58 B–C 10.35

283.58 C–B 12.01

C

600 oC/4 h

284.58 C–C 55.08

285.78 C–H 29.24

288.38 O–C=O 3.67

192.20 B–O–B 26.76

B 190.68 B–O 60.69

189.63 B–C 12.56

283.55 C–B 22.83

C

600 oC/6 h

284.48 C–C 46.97

285.28 C–H 23.51

286.38 C–O 6.68

192.22 B–O–B 17.39

B 190.63 B–O 58.74

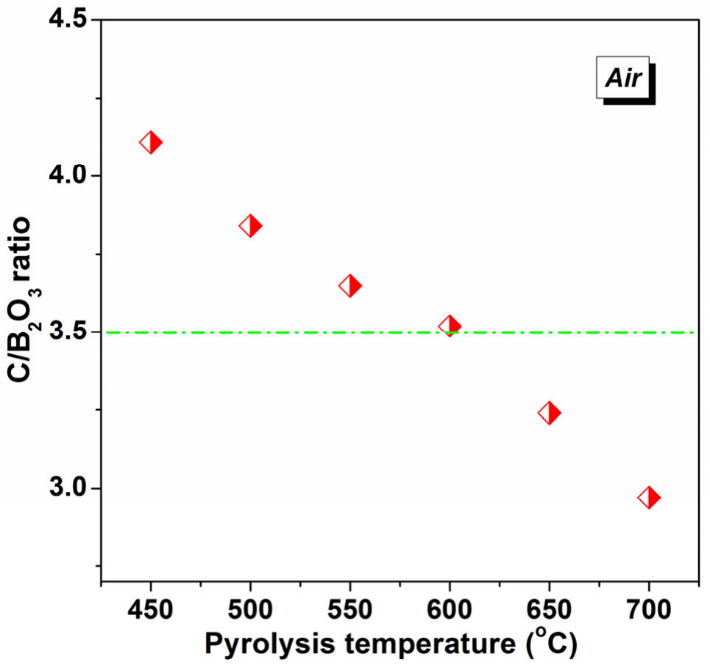
189.55 B–C 23.87

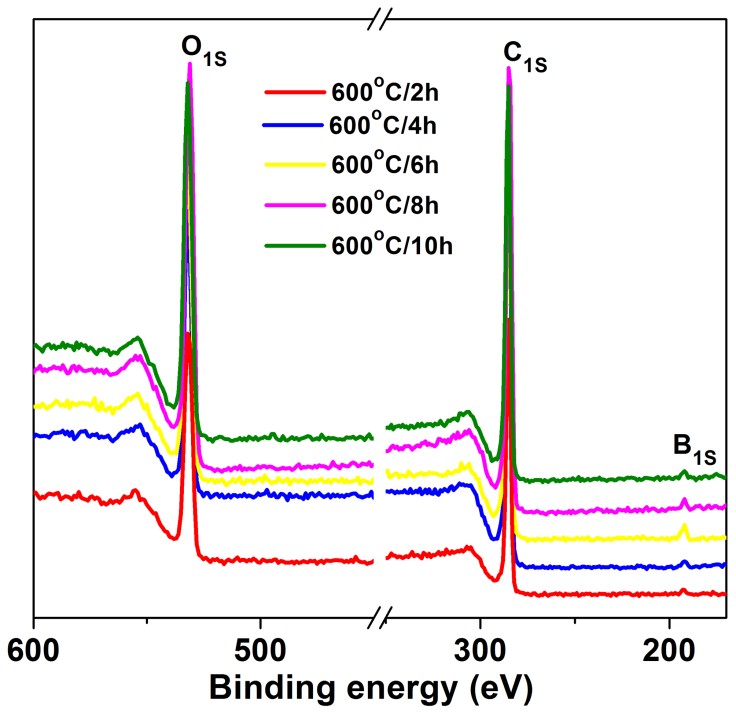
600 oC/8 h C

283.43 C–B 32.74

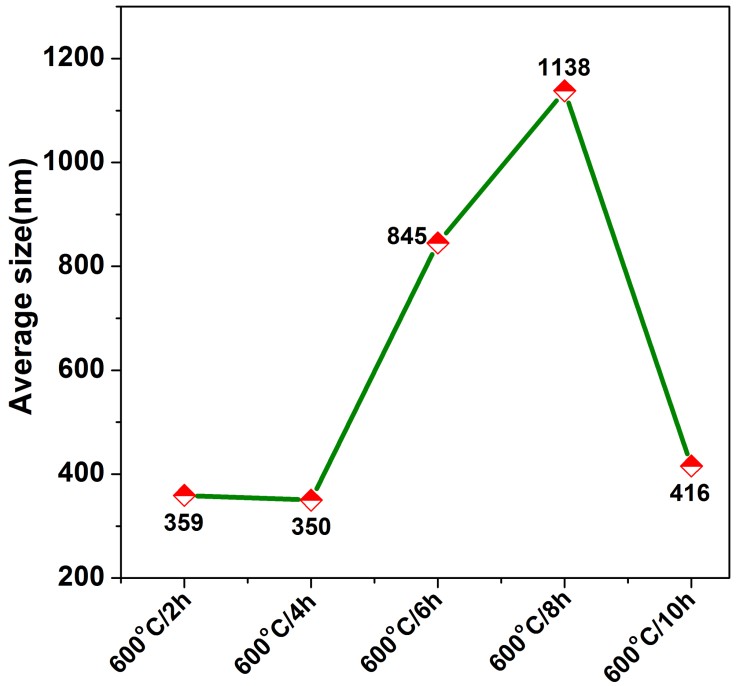
284.48 C–C 46.62

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | 285.78 | C–H | 15.38 |
| 287.28 | C=O | 5.26 |
| 192.18 | B–O–B | 13.87 |
|  | B | 190.56 | B–O | 52.63 |
|  |  | 189.51 | B–C | 33.50 |
|  |  | 283.40 | C–B | 39.87 |
|  |  | 284.51 | C–C | 44.90 |
|  | C |  |  |  |
|  |  | 285.38 | C–H | 8.57 |
| 600 oC/10 h |  | 287.18 | C=O | 6.66 |
|  |  | 192.24 | B–O–B | 11.68 |
|  |  | 190.63 | B–O | 43.27 |
|  | B |  |  |  |
|  |  | 189.54 | B–C | 41.69 |
|  |  | 187.78 | B–C | 3.35 |

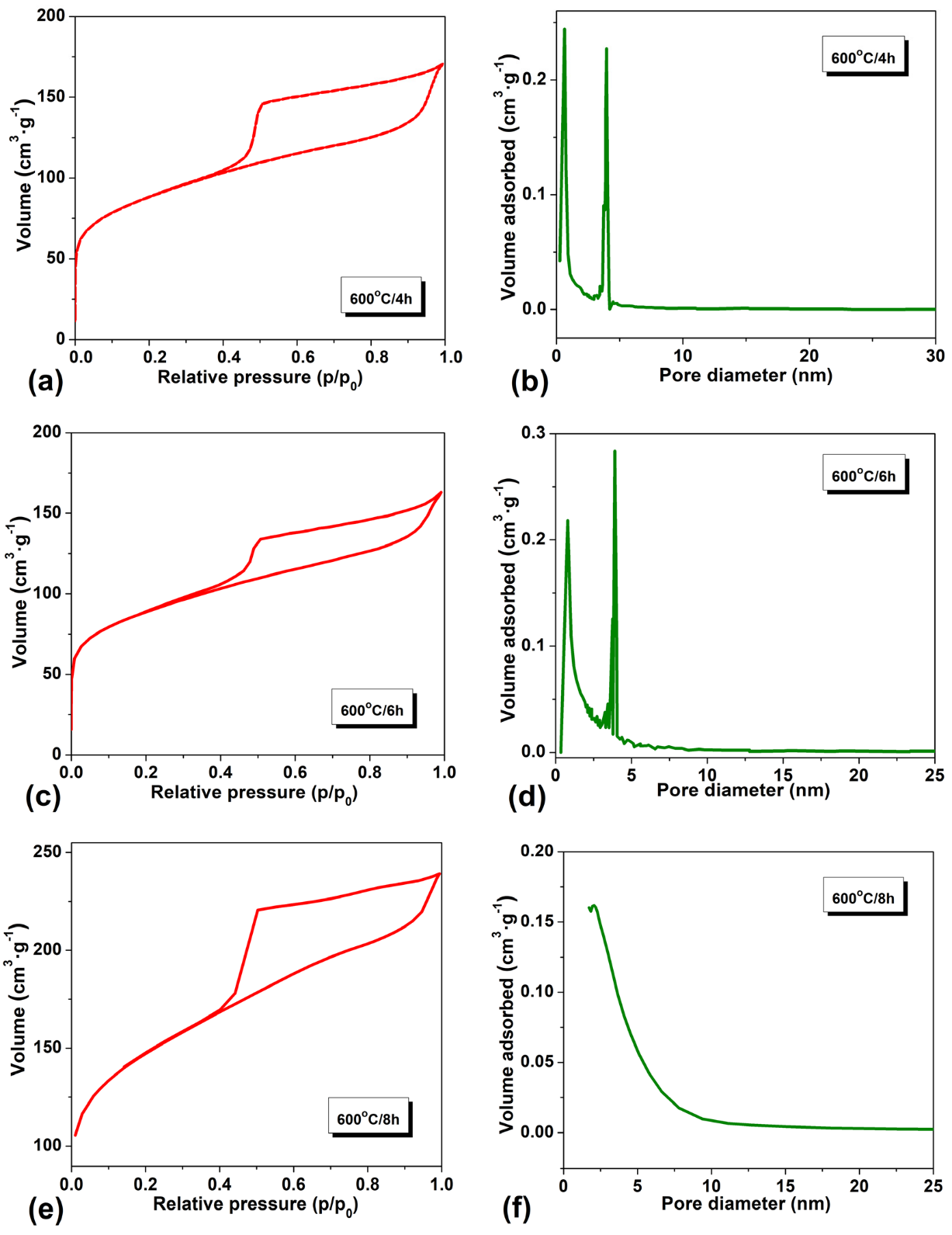


**FIG. S1.** Changes in the C/B2O3 molar ratios of the precursor powders prepared after pyrolysis at temperatures of 450-700 oC for 2 h in a muffle furnace under an air atmosphere.

**FIG. S2.** The full scanned XPS spectra of the pyrolysis products of PRB obtained by heat treatment at 600 °C for different durations in air after washing.



**FIG. S3.** The particle size of the pyrolysis products of PRB obtained by heat treatment at 600 °C for different durations in air after washing.



**FIG. S4.** The N2 adsorption-desorption isotherm curves (a, c, e) and pore size distribution (b, d, f) plots of the pyrolysis products of PRB obtained by heat treatment at 600 °C for different durations in air after washing.