Supplementary Information for:

Suppressed Boron Doping in Electrospun Carbon Webs from Polyacrylonitrile-Based Polymer Blends

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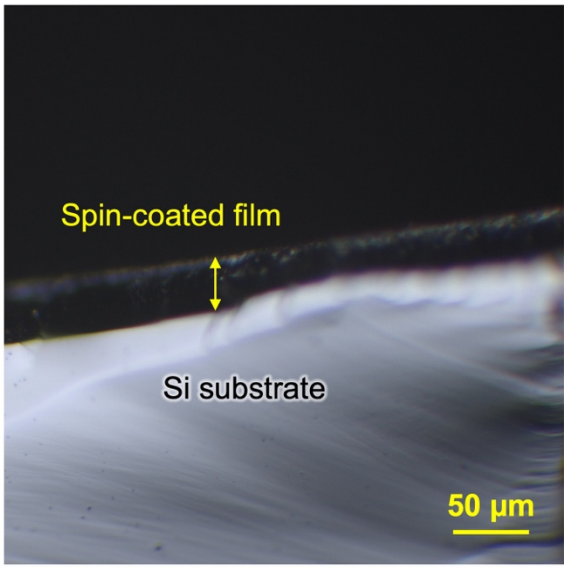

Fig. S1 Optical microscopy (OM) cross-sectional image of a spin-coated film on a Si substrate, showing a film thickness on the order of ~30 µm. The scale bar represents 50 µm.

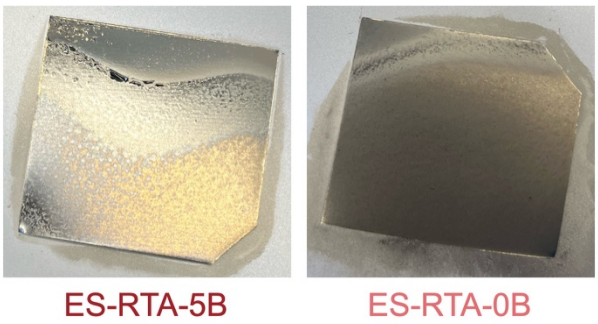

Fig. S2 Photographs of electrospun fibers with (ES-RTA-5B) and without BDBA (ES-RTA-0B) after rapid thermal annealing (RTA) on 4 cm × 4 cm stainless-steel substrates, showing delamination following stabilization at 300 °C for 30 min and subsequent heating to 800 °C for 1 min.

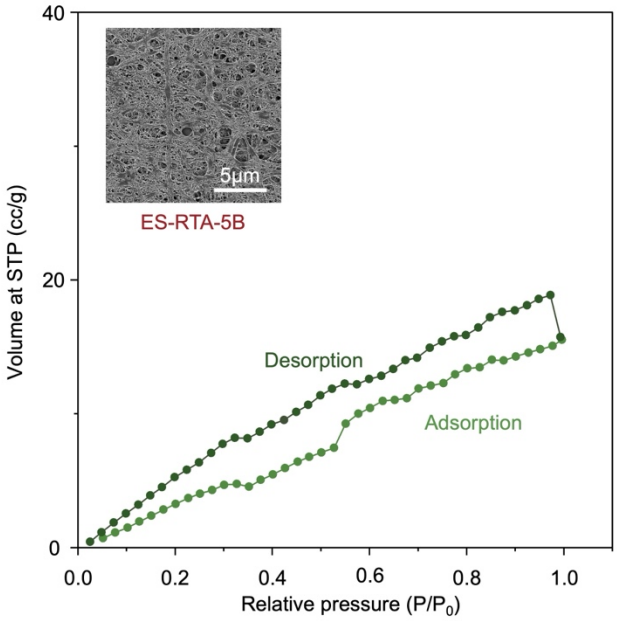

Fig. S3 Nitrogen adsorption–desorption isotherms of the electrospun fiber sample containing BDBA after RTA (ES-RTA-5B). The inset shows an SEM image of the corresponding porous fibrous morphology. Scale bar represents 5 μm.

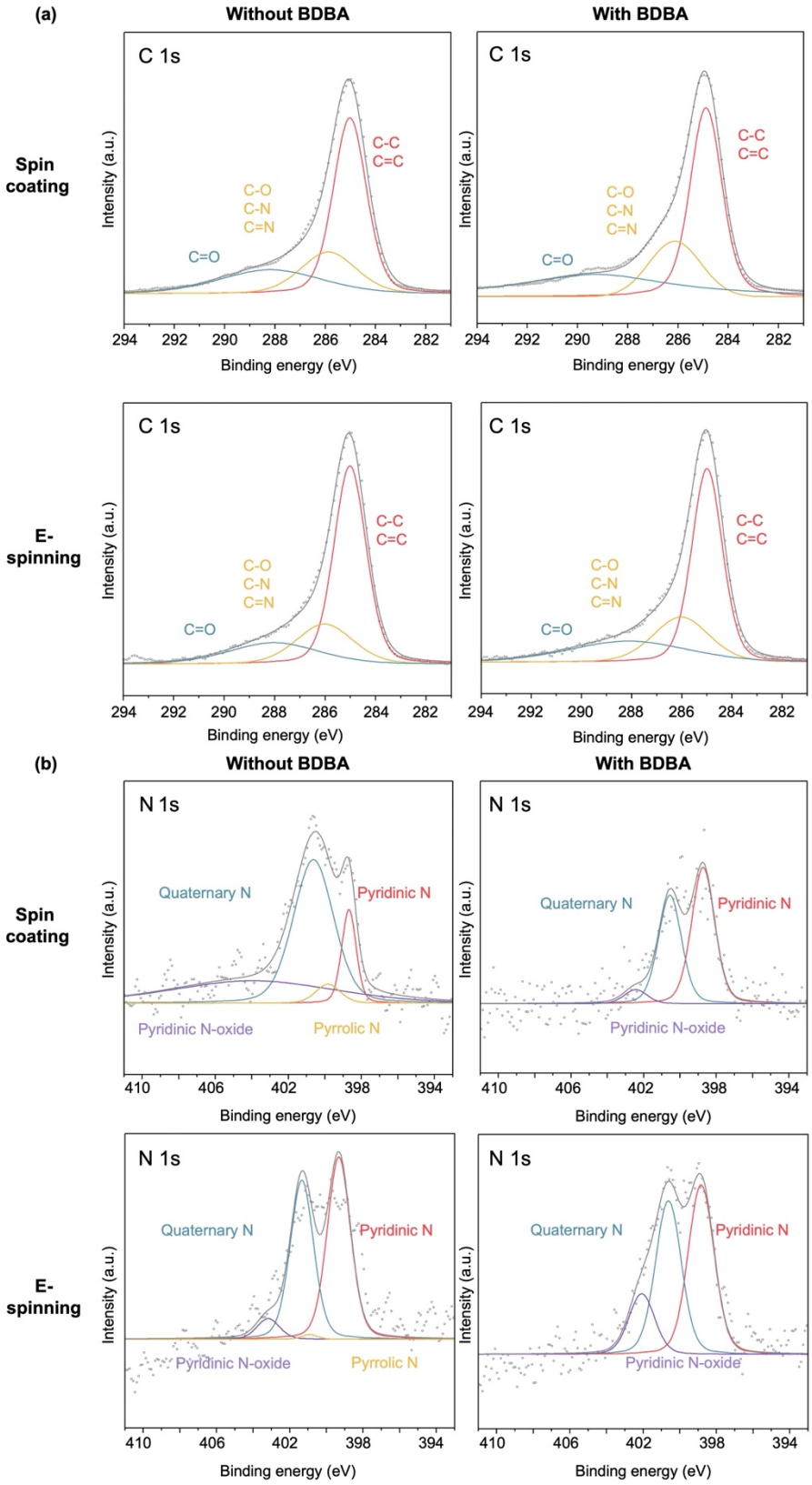

Fig. S4 High-resolution XPS spectra of **(a)** C 1s and **(b)** N 1s regions for spin-coated films and electrospun fibers with and without BDBA after RTA. Peak deconvolution of the C 1s spectra

indicates contributions from C–C/C=C, C–N/C=N, C–O, and C=O bonding[1–3], while the N 1s spectra show pyridinic N, pyrrolic N, quaternary N, and pyridinic N-oxide[3,4]. Although B–C bonding is evident in the B 1s spectra, it is not clearly seen in the C 1s spectra, likely due to the relatively low boron content.

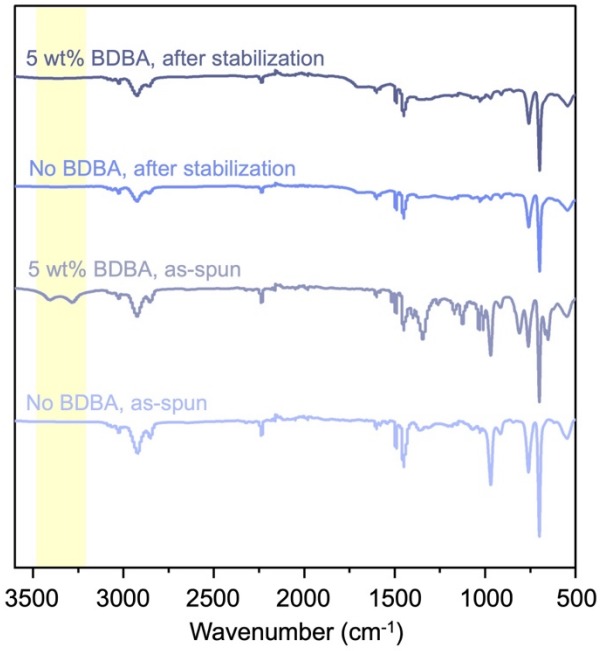

Fig. S5 FTIR spectra of spin-coated films with and without BDBA before RTA (as-spun) and after stabilization (300 °C / 30 min). The boronic acid O–H stretching band (~3250–3500 cm^{-1}) present in BDBA-containing films disappears after stabilization, consistent with BDBA condensation.[5]

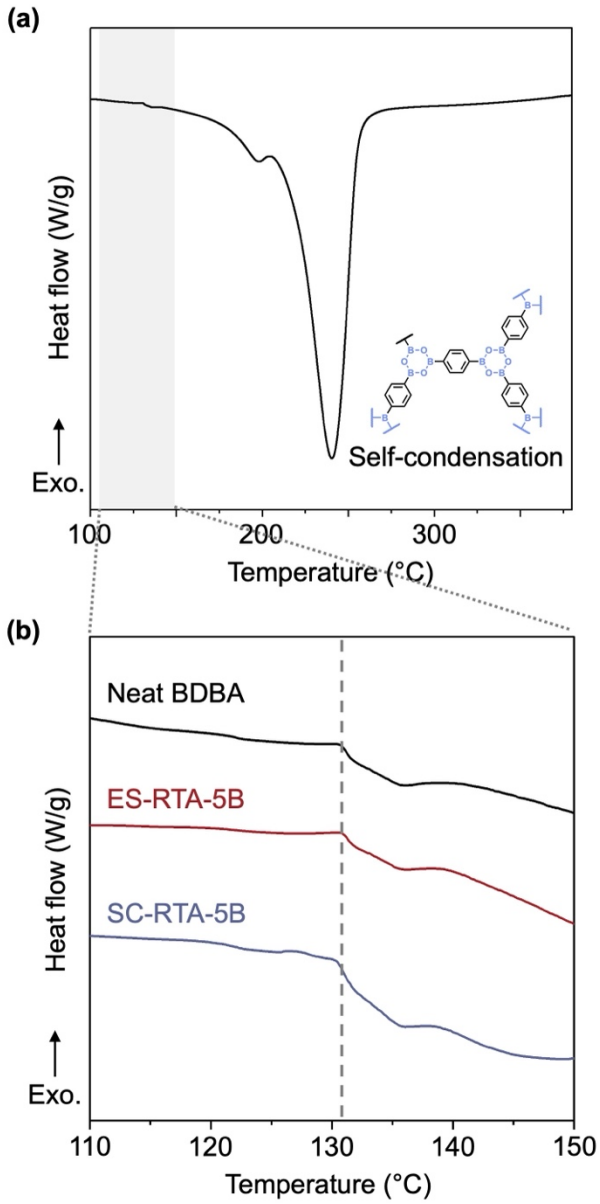

Fig. S6 Differential scanning calorimetry (DSC, in air) trace of **(a)** neat benzene-1,4-diboronic acid (BDBA) and **(c)** BDBA-containing samples. A thermal feature with a comparable onset temperature (~130–150 °C) is observed in neat BDBA and in both electrospun fibers and spin-coated films containing BDBA, suggesting that this feature is associated with BDBA and is not strongly dependent on sample geometry.

Table S1. XPS elemental composition (at. %) of spin-coated films and electrospun fibers with and without BDBA after RTA.

Sample	C (at. %)	O (at. %)	N (at. %)	B (at. %)
SC-RTA-5B	79.8	14.3	3.2	2.7
ES-RTA-5B	81.2	14.8	3.6	0.4
SC-RTA-0B	80.4	15.9	3.7	0.0
ES-RTA-0B	80.3	14.7	5.0	0.0

References

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