

Supporting Information

A Feasible Way to Produce Carbon Nanofiber by Electrospinning from Sugarcane Bagasse

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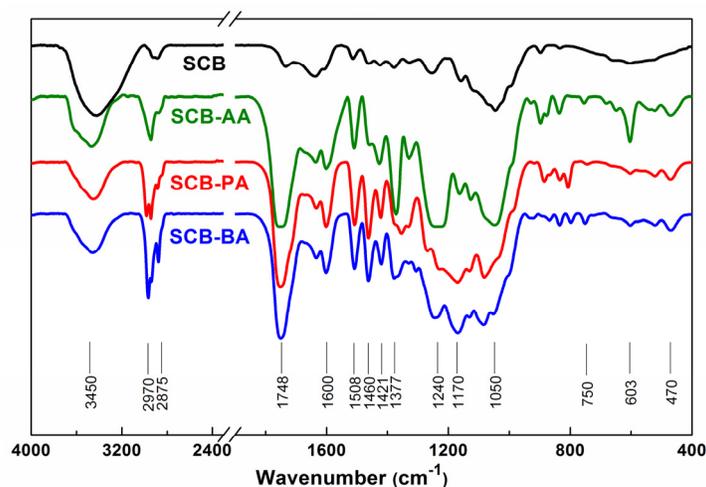
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Figure S1. FT-IR spectra of SCB and different SCB esters.

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In this study, the effect of chemical modification on the structure of SCB was demonstrated by FT-IR in the region of 4000–400 cm^{-1} . As shown in Figure S1, the intensity in broad region peak for -OH stretching vibrations at 3450 cm^{-1} of SCB-A showed an obvious decrease comparing to that of unmodified SCB. It indicated that the hydroxyl groups were involved in the homogeneous esterification [1]. In addition, the intensities of C–H bending vibrations (such as 1460, 1421 and 1377 cm^{-1}) were also enhanced after the introduction of aliphatic acyl groups. Meantime, a significant increase of peak intensity in the broad region at 1748 cm^{-1} for C=O stretching vibrations was observed. In general, these results indicated that the esterification of SCB with three acid anhydrides occurred successfully in the homogeneous system, which was consistent with the previous literatures [2-4].

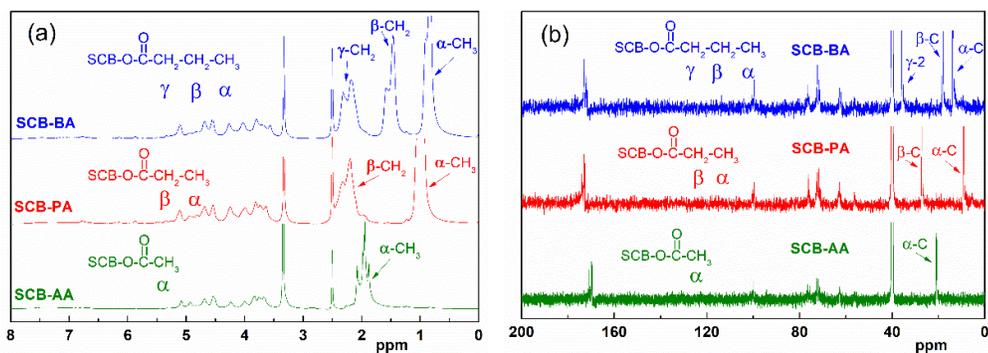


Figure S2. (a) ^1H NMR and (b) ^{13}C NMR spectra of different SCB esters.

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43 To further confirm the esterification of SCB with acid anhydrides, SCB and SCB-A were
 44 characterized with ^1H NMR and ^{13}C NMR spectroscopy, and the spectra are shown in Figure S2. In the
 45 ^1H NMR spectra (Figure S2a), the signals at 2.5 and 3.3 ppm are assigned to DMSO- d_6 and water,
 46 respectively, and the signals in the range of 0.5 to 2.4 ppm are attributed to the acyl moieties [2,4]. In
 47 the ^1H NMR spectrum of SCB-AA, there was a wide signal between 1.6 and 2.2 ppm that was assigned
 48 to the hydrogen proton in methyl group ($\alpha\text{-CH}_3$) from the attached acetyl group. The proton signals at
 49 2.0-2.4 ppm and 0.5-1.2 ppm attributed to $\beta\text{-CH}_2$ and $\alpha\text{-CH}_3$ of SCB-PA. In the ^1H NMR spectrum of
 50 SCB-BA, three distinct signals emerging in the chemical shift between 0.5 and 2.4 ppm corresponds to
 51 $\gamma\text{-CH}_2$ ($\delta_{\text{H}}=2.0\text{-}2.4$ ppm), $\beta\text{-CH}_2$ ($\delta_{\text{H}}=1.2\text{-}1.7$ ppm), and $\alpha\text{-CH}_3$ ($\delta_{\text{H}}=0.5\text{-}1.0$ ppm) groups [4]. The signals
 52 range from 173.0 to 169.0 ppm corresponds to the carbonyl of $\text{C}=\text{O}$ were emerged in ^{13}C NMR
 53 spectrum of SCB-A (Figure S2b), which provided the direct evidence of the successful attachment of
 54 the corresponding aliphatic side chains onto SCB-A. The signal at 21.1 ppm is assigned to $\alpha\text{-C}$ of acetyl
 55 group in SCB-AA, the signals at 27.2 and 9.5 ppm are assigned to $\beta\text{-C}$ and $\alpha\text{-C}$ of propionyl group in
 56 SCB-PA and the signals at 35.6, 18.2 and 13.9 ppm are assigned to the carbons of $\gamma\text{-C}$, $\beta\text{-C}$ and $\alpha\text{-C}$ of
 57 butyryl group in SCB-BA, respectively. Those results confirmed the successful esterification of SCB,
 58 which was consistent with the results of FT-IR analysis above and other similar literatures [1,2,5].
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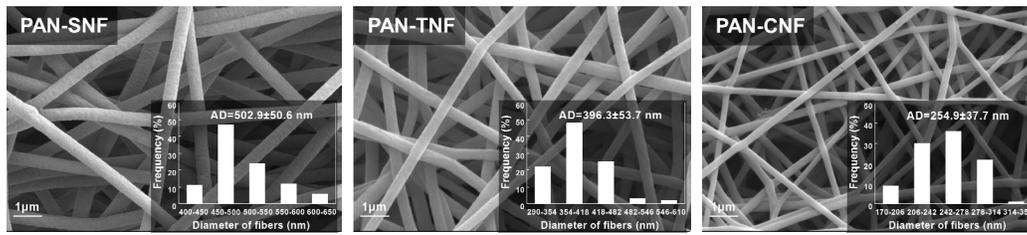


Figure S3. SEM images of electrospun PAN nanofiber mats in different stages (scale bar=1 μ m).

65 Table S1. The TGA/DTG data and residue content of different samples

Sample	T _{in} (°C) ¹	T ₅₀ (°C) ²	T _{max} (°C) ³	Residue (%) ⁴
SCB	275.8±1.7	332.2±3.1	345.5±6.7	16.1±7.0
SCB-AA	272.2±6.2	345.1±5.5	337.8±1.5	24.8±2.1
SCB-PA	281.9±2.6	355.5±2.1	356.1±2.9	17.6±4.8
SCB-BA	292.2±2.5	359.3±2.7	360.4±1.1	17.1±1.2
PAN-SNF	301.3±4.9	411.0±6.4	311.3±3.5	36.1±1.5
AA-SNF-50%	303.3±1.3	363.0±9.9	328.1±4.0	36.1±1.6
PA-SNF-50%	303.4±5.4	366.9±6.4	323.9±4.8	32.6±1.2
BA-SNF-50%	308.8±0.4	372.3±4.3	331.3±2.8	30.8±1.2

66 ¹T_{in}: Initial decomposition temperature; ²T₅₀: 50% weight loss temperature; ³T_{max}: temperature of the67 DTG peak; ⁴Residue: the residue at 700 °C.

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Table S2. The characterization of graphite structure derived from XRD of different CNFs

Sample	$d_{(002)}$ (Å)	Crystallite size, L_c (nm)	Lateral size, L_a (nm)
PAN-CNF	3.64±0.02	1.02±0.07	2.98±0.21
AA-CNF-50%	3.64±0.04	0.94±0.08	2.65±0.01
PA-CNF-50%	3.63±0.08	0.96±0.02	2.78±0.67
BA-CNF-50%	3.61±0.05	1.02±0.04	3.51±0.28

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