

Supplementary materials for
Sosnowski Hogweed-based hard carbons for sodium-ion batteries

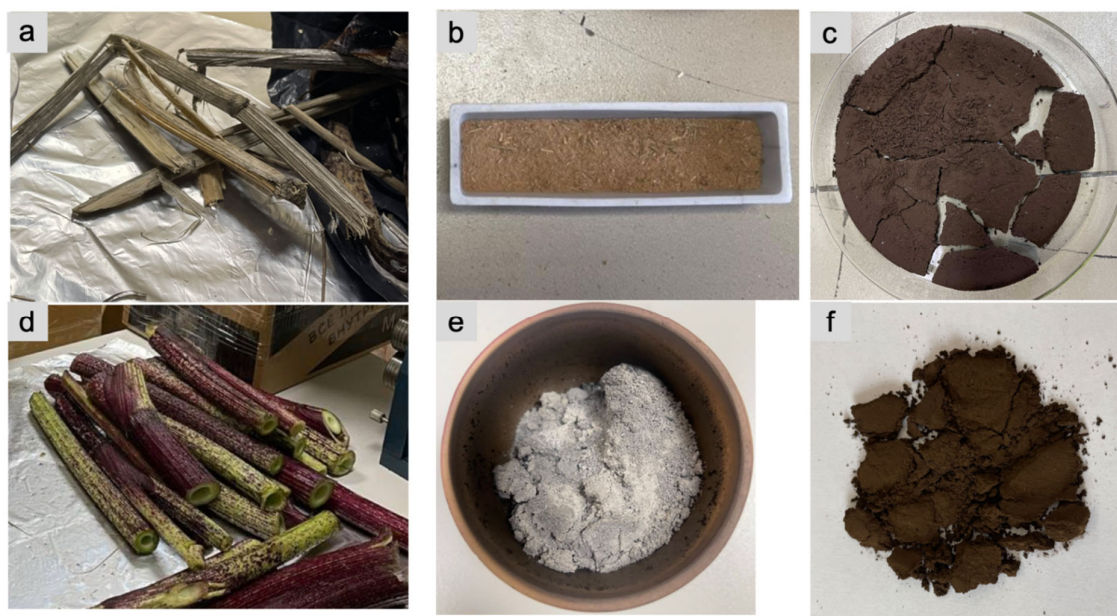


Figure S1. Photo images of winter (WH) (a) and summer (SH) (d) hogweed stems and intermediate products WH-A200 (b), WH-H200 (c), SH-A200HCl before HCl treatment (e), SH-H200 (f).

Table S1. Results of CHNSO analysis. Results presented as weight percent \pm standard deviation (n=3).

Sample	C, %	$\pm\%$	H, %	$\pm\%$	N, %	$\pm\%$	S, %	$\pm\%$	O, %	$\pm\%$	Total, %
WH	44.8	0.4	6.46	0.13	0.44	0.06	0.86	0.09	41.1	0.6	93.7
WH-A200	46.2	0.4	5.99	0.01	1.38	0.25	0.83	0.08	40.2	0.1	94.6
WH-H200	58.2	0.5	5.62	0.21	0.51	0.01	0.67	0.07	38.4	0.1	103.4
SH	37.8	0.2	5.74	0.17	1.09	0.09	0.17	0.03	43.5	0.1	88.3
SH-A200HCl	68.4	0.5	4.59	0.03	2.67	0.11	<0.10	-	20.7	0.7	96.4
SH-H200	61.9	0.2	5.21	0.01	1.93	0.02	<0.10	-	20.3	0.1	89.3

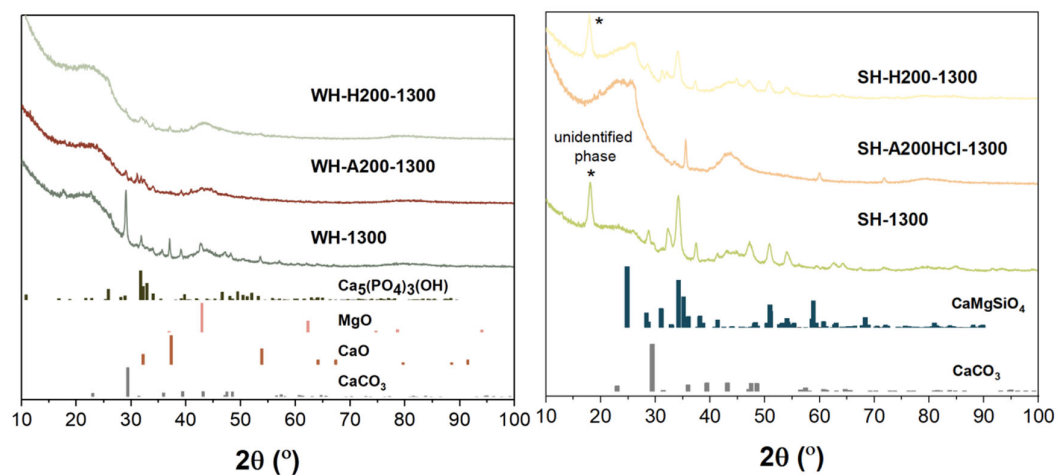


Figure S2. PXRD data of different hard carbons.

Table S2. Results of the EDX analysis of HC samples.

	C (%)*	Mg (%)	Si (%)	P (%)	K (%)	Ca (%)	Fe (%)	S (%)
WH-1300	99.23	0.06	0.14	0.03	0.08	0.47	0	0
WH-A200-1300	96.95	0	0.15	0.18	0.67	2.05	0	0
WH-H200-1300	99.85	0	0	0	0	0.15	0	0
SH-1300	96.08	0.10	0.05	0.26	1.22	2.30	0	0
SH-A200HCl-1300	97.54	0	0.85	0.10	1.18	0.12	0.20	0
SH-H200-1300	96.16	0	0.09	0.24	0.65	2.71	0	0.14

*All results in atomic %

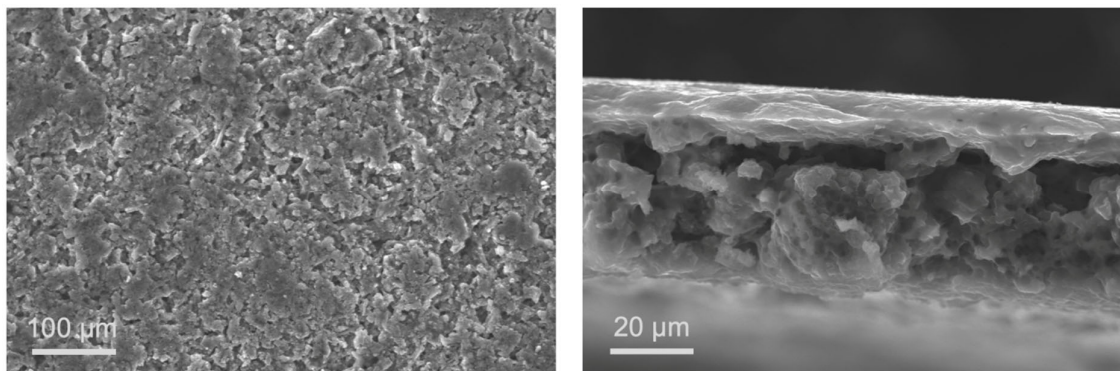


Figure S3. SEM images of SH-1300 electrode after 10 cycles at C/10.

Table S3. Comparison with hard carbon from the literature .

Precursor	Preparation conditions	Capacity	ICE	Ref.
WH-A200-1300	Air pre-treatment, carbonization at 1300 °C	262 mAhg ⁻¹ at 25 mA/g	74%	this work
SH-A200HCl-1300	Air and acid pre-treatment, carbonization at 1300 °C	221 mAhg ⁻¹ at 25 mA/g	87%	this work

Garlic	Carbonization at 1300 °C	260 mAhg ⁻¹ at 0.05 A/g	50.7%	[39]
Peanut shell	Hydrothermal pre-treatment, carbonization at 800 °C	261 mAhg ⁻¹ at 0.1 C	58%	[40]
Tea Leaves	Hydrothermal pre-treatment, carbonization at 600 °C	179 mAhg ⁻¹ at 100 mA/g	70%	[41]
Spinifex Grass	Carbonization at 1000 °C	366 mAhg ⁻¹ at 20 mA/g	50%	[42]
Recycled cork	Carbonization at 1600 °C	385 mAhg ⁻¹	81%	[43]

References

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