Supplementary Information for

From Waste to Power: Utilizing Barley Husk as a Sustainable Anode Active Material Alternative to Graphite in Lithium-ion Batteries

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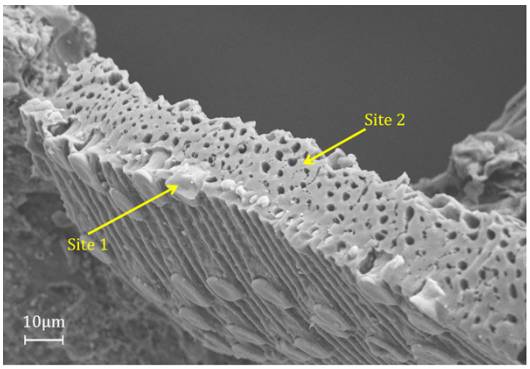
Keywords: anode materials, lithium-ion batteries, biomass, sustainability

a



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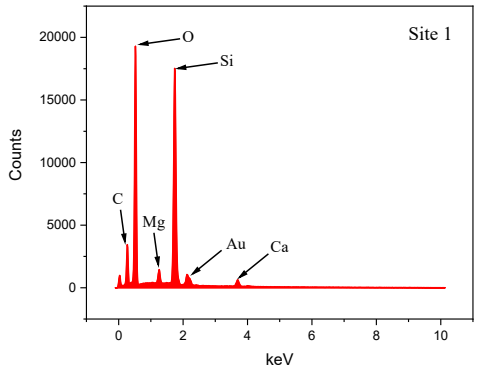

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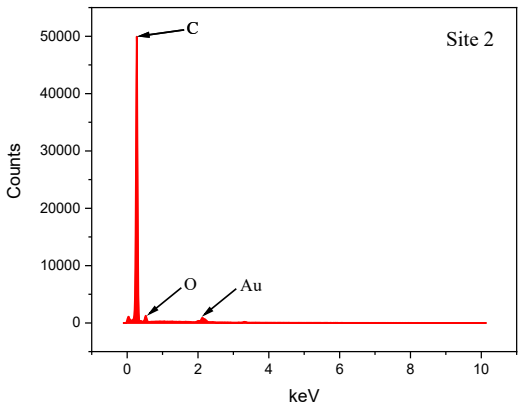
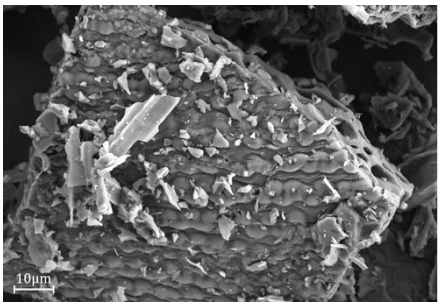


Fig. S1 a) SEM image of BHs-SiO_2/C sample, b) and c) EDX analysis of selected points.

a



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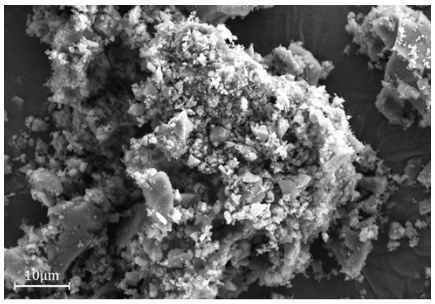

Fig. S2 SEM images of a) MG-BHs-SiO_2/C and b) BM-BHs-SiO_2/C samples.

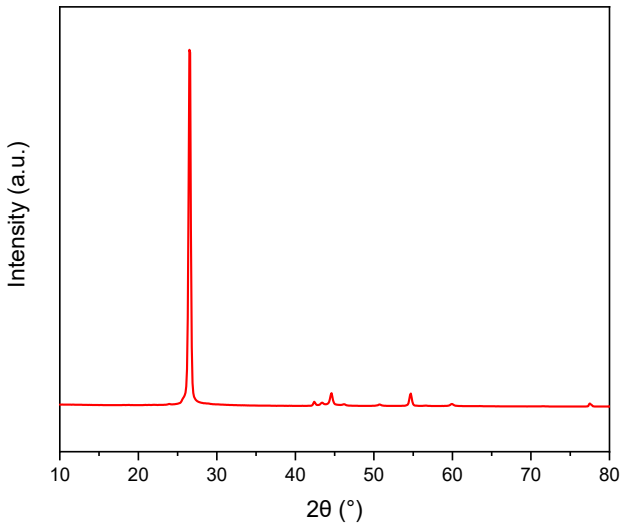

Fig. S3 XRD pattern of Graphite.

Table S1 The detailed XRD results of the BM-BHs-SiO_2/C sample

2θ (°)	d_{002} (nm) (I)	$FWHM$ (°)	L_c (nm) (II)	N (III)	B (cps) (IV)	$A(cps)$ (IV)	R (IV)
23.80	0.3734	2.8	2.8662	7.68	4.64×10^4	1.76×10^4	2.6281

(I) Interlayer spacing (d_{002}) is calculated using Bragg's diffraction equation in Eq. (S1)

$$d_{002} = \frac{\lambda}{2\sin(\theta)} \quad \text{(S1)}$$

where λ is the X-ray wavelength (1.54 Å for Cu Kα radiation), and θ is half of the 2θ angle for the (002) peak.

(II) Crystallite size along the c-axis (L_c) is calculated using Scherrer equation in Eq. (S2)

$$L_C = \frac{K\lambda}{\beta\cos(\theta)} \quad \text{(S2)}$$

where K is the Scherrer constant (0.89 for carbon materials), and β is the full width at half maximum ($FWHM$) of the (002) peak in radians.

(III) Number of carbon Layers along the c-axis (N) is calculated using d_{002} and L_C in Eq. (S3)

$$N = \frac{L_C}{d_{002}} \quad \text{(S3)}$$

(IV) The empirical R value is calculated using eq (S4)

$$R = \frac{B}{A} \tag{S4}$$

where B is the peak intensity and A is the baseline intensity, which are illustrated in Figure S4.

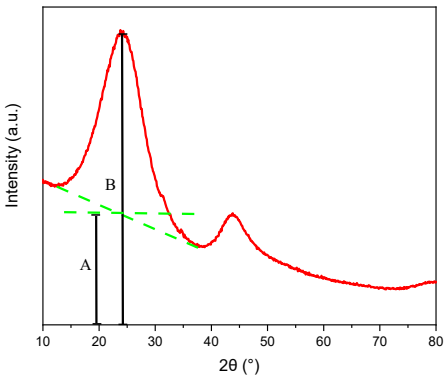

Fig. S4 Determining values of A and B from XRD to be used in Eq. (S4).

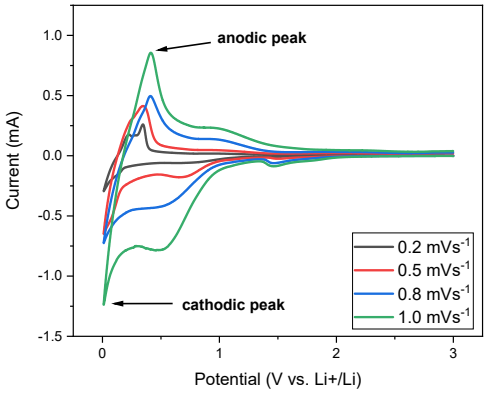

Fig. S5 Cyclic voltammetry curves of the Graphite anode at varying scan rates (0.2, 0.5, 0.8, and 1.0 mVs^{-1}).

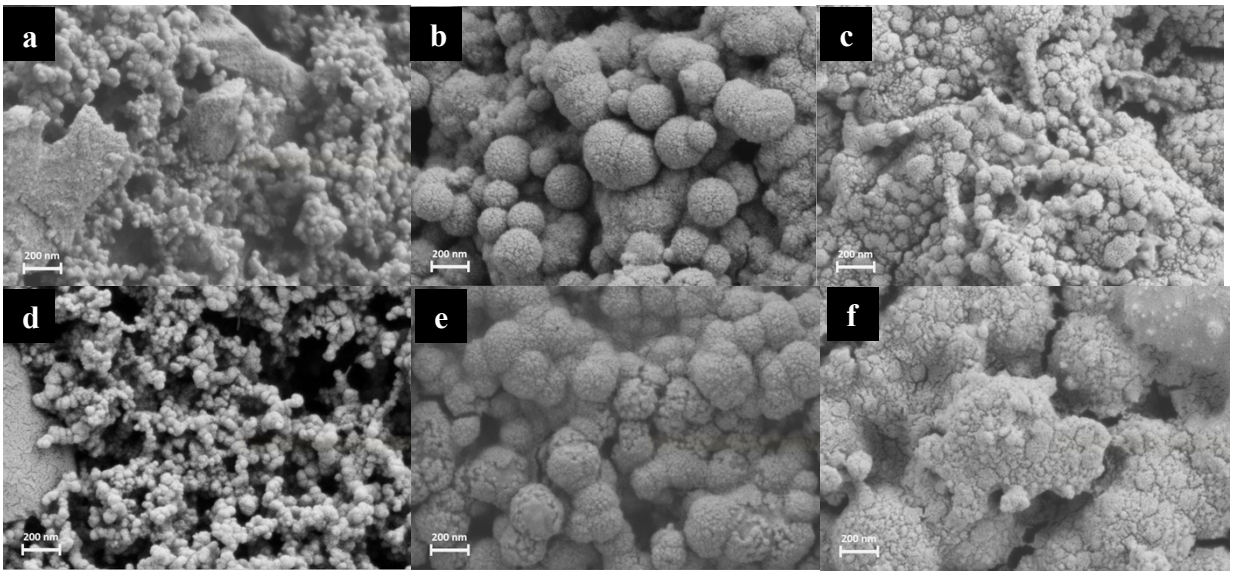

Fig. S6 Zoomed-in postmortem SEM images of BM-BH-SiO_2/C and graphite anodes at the same cycling stages shown in Figure 6. a–c) BM-BH-SiO_2/C anode before cycling, after 10 cycles, and after 100 cycles. d–f) Graphite anode before cycling, after 10 cycles, and after 100 cycles.