

# A Facile Approach for Synthesizing High Performance MnO/C Electrodes from Rice Husk

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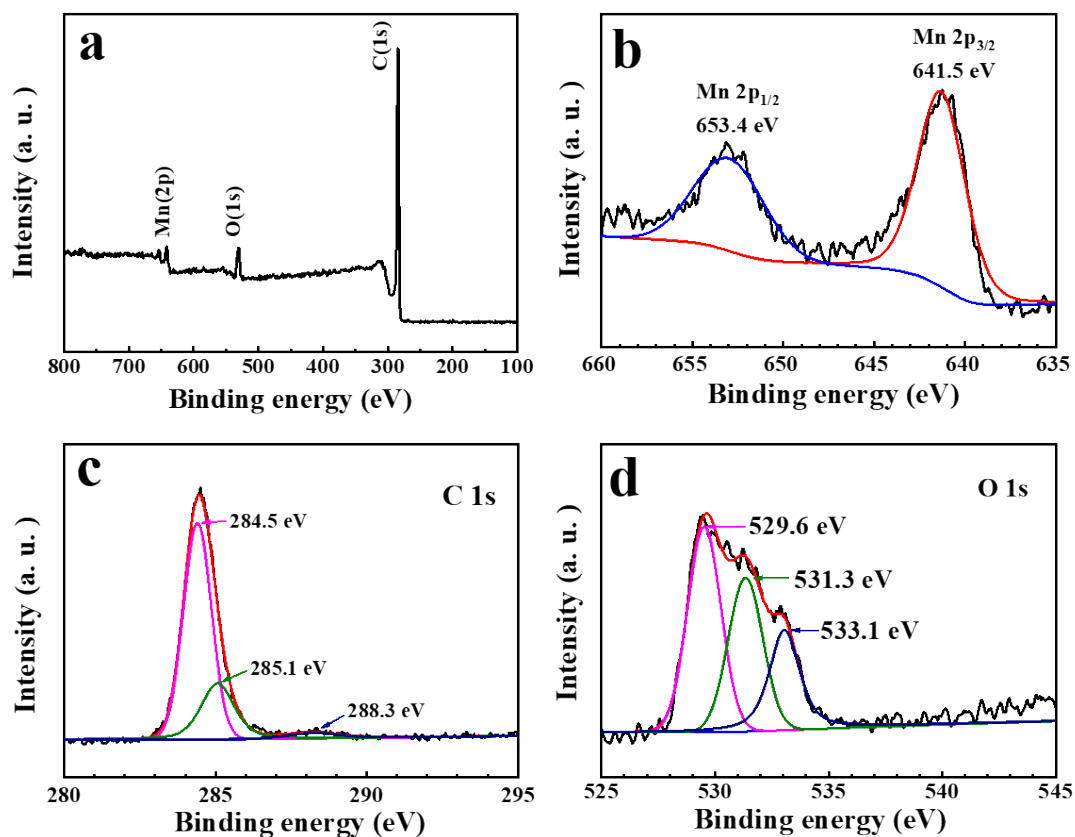
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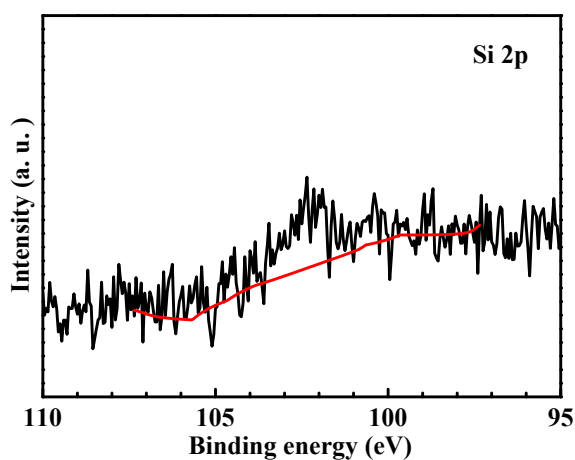
## S1. XPS Analyses:

X-ray photoelectron spectroscopy (XPS) tests were performed on an ESCALAB 250Xi spectrometer (ThermoFisher Scientific, USA) with Al  $K_{\alpha}$  radiation of 1486.6 eV as the excitation energy.

The surface electronic state and the composition of MnO/C-600 was evaluated by X-ray photoelectron spectroscopy (XPS). As shown in **Figure S1a**, the XPS survey spectrum contains signals for Mn(2p), O(1s) and C(1s) electrons, indicating the presence of Mn, O, and C atoms in the composite. Detailed scans on these regions were undertaken to provide more detailed information. The Mn(2p<sub>3/2</sub>) and Mn(2p<sub>1/2</sub>) features were found at 641.5 and 653.4 eV, respectively (**Figure S1b**) and the energy difference between the two is 11.9 eV. This confirmed a manganese oxidation of Mn (II), suggesting the existence of MnO in the composite material.<sup>1</sup> The XPS spectrum for C(1s) (**Figure S1c**) can be fitted to reveal three small peaks at 284.5, 285.1 and 288.3 eV, corresponding to C(sp<sup>3</sup>)-C, C(sp<sup>3</sup>)-O and O-C(sp<sup>2</sup>)=O, respectively.<sup>1</sup> Similarly, XPS spectrum of O(1s) region shows a broad envelope that can be de-convoluted into three individual peaks corresponding to Mn-O (529.6 eV), C=O (531.3 eV) and H-O (533.1 eV), respectively.<sup>2</sup>



**Figure S1.** XPS spectra of MnO/C-600; (a) the survey spectrum at high-resolution together with the assigned peak positions, (b) the Mn(2p) feature indicating the presence of Mn(II) (Mn(2p<sub>3/2</sub>) (641.5 eV, red) and Mn(2p<sub>1/2</sub>) (653.4 eV, blue); (c) the C(1s) range indicating the presence of C (284.5 eV, purple) and of partially oxidized carbon in the form of C-O (285.1 eV, green) and O-C=O (288.3 eV, blue); (d) O(1s) that support the presence of Mn-O (529.6 eV, purple), C=O (531.3 eV, green) and H-O (533.1 eV, blue).



**Figure S2.** The Si 2p XPS spectrum of MnO/C-600

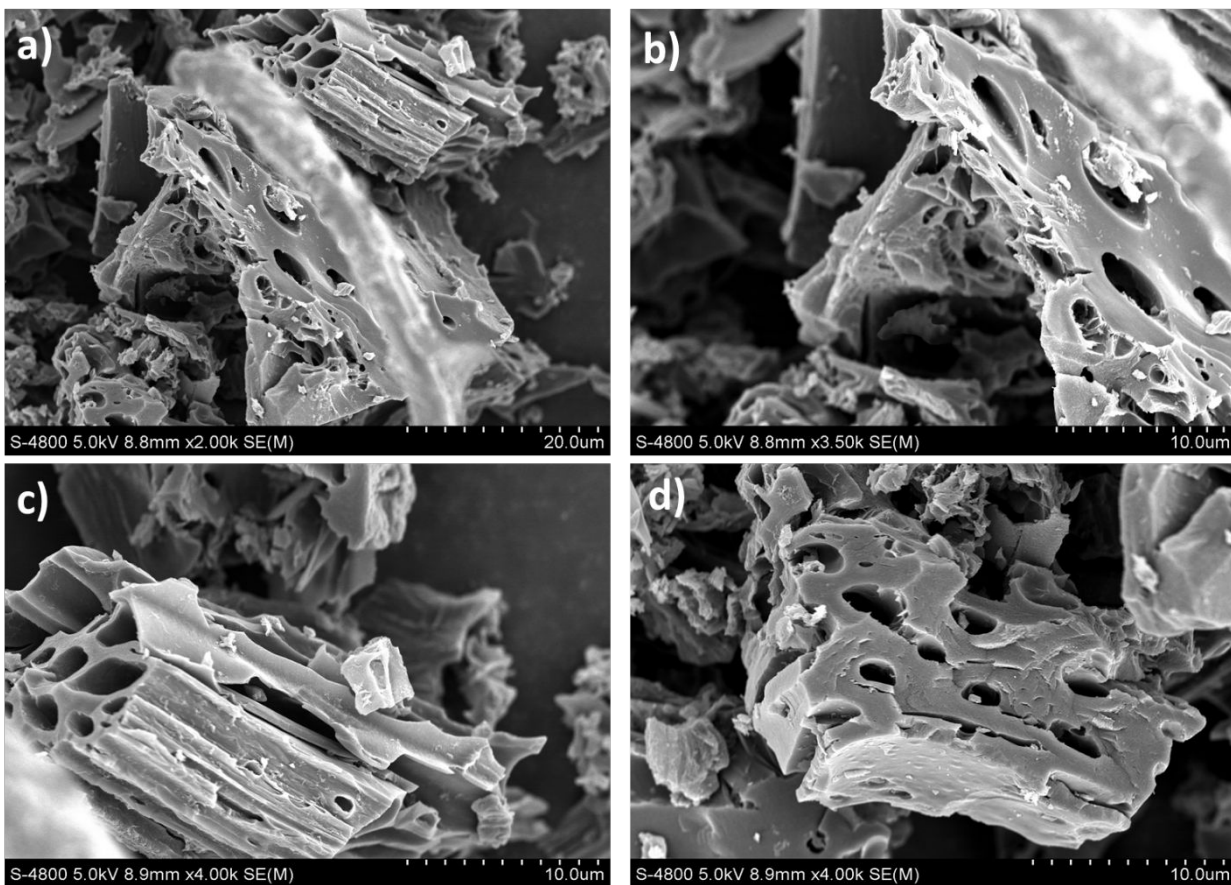


Figure S3. (a) The SEM image of original rice husk with 20  $\mu\text{m}$  resolution; (b-d) The SEM images of original rice husk with 10  $\mu\text{m}$  resolution

### References:

1. Ding, Y.; Du, J.; Guo, L. G.; Zhou, H. B.; Yang, H. P.; Wang, F., Nanoscale MnO and natural graphite hybrid materials as high-performance anode for lithium ion batteries. *Electrochim Acta* **2015**, *170*, 9-15.
2. Thommes, M.; Kaneko, K.; Neimark, A. V.; Olivier, J. P.; Rodriguez-Reinoso, F.; Rouquerol, J.; Sing, K. S. W., Physisorption of gases, with special reference to the evaluation of surface area and pore size distribution (IUPAC Technical Report). *Pure Appl Chem* **2015**, *87* (9-10), 1051-1069.