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Supporting Information

Hard Carbon Anode of Sodium-Ion Batteries: Undervalued Rate Capability

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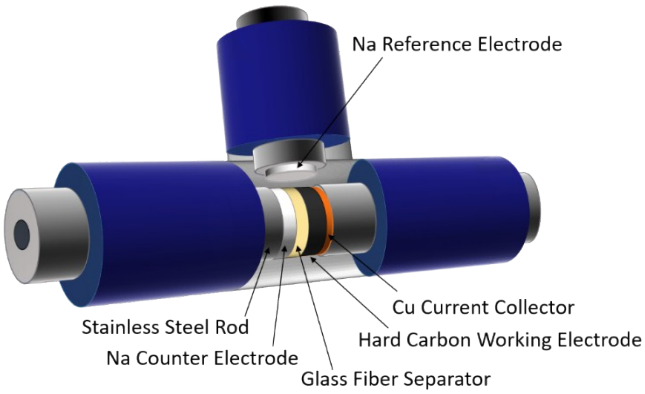

Fig. S1 Schematic of the three-electrode cell setup.

Experimental Section

Material synthesis: FP-HC was synthesized by pyrolysis of filter paper at 1400 ˚C under Ar gas flow for 5 h.

Material characterization: XRD pattern of FP-HC was collected on a Rigaku Ultima IV Diffractometer with Cu Kα (λ= 1.5406 Å) radiation. Raman spectra were obtained from WITec confocal Raman spectrometer with a 514 nm laser source and the peaks were deconvoluted by Origin 8.5. Transmission electron microscopy (TEM) was performed on FEI Titan 80-200 TEM.

Electrochemical measurements: Coin cells (CR2032) and homemade T-Cell (three-electrode cell) were used for the electrochemical measurements. The working electrode consisted of hard carbon, polyvinylidene fluoride (PVdF) and carbon black additive with a mass ratio of 80:10:10. The electrodes were prepared by grounding active material, carbon black and PVdF with N-Methyl-2-pyrrolidone (NMP) as the solvent, and the obtained slurry is coated onto Cu foil by doctor blade and dried at 100 ˚C for 12 h under vacuum. The active mass loading for all electrodes are between 1.5 to 2 mg/cm^2. The electrolyte for all cells is 1.0 mol/L $NaPF_6$ solution in ethylene carbonate (EC)/diethyl carbonate (DEC) (1:1 in volume). Galvanostatic sodiation/desodiation tests are performed in the potential range of 0.01-2 V vs the reference electrode on Arbin BT2000 system at room temperature. Three-electrode cell sodiation/desodiation profiles are collected on a VMP-3 multichannel workstation at room temperature. Sodiation and desodiation of hard carbon in both two-electrode half-cells and the three-electrode cells were at the same current rates of 1 C (250 mA/g), 2 C, 5 C and 10 C, respectively.