Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information

Scalable synthesis of nanometric α-Fe_2O_3 within interconnected carbon shells from pyrolytic alginate chelate for lithium storage

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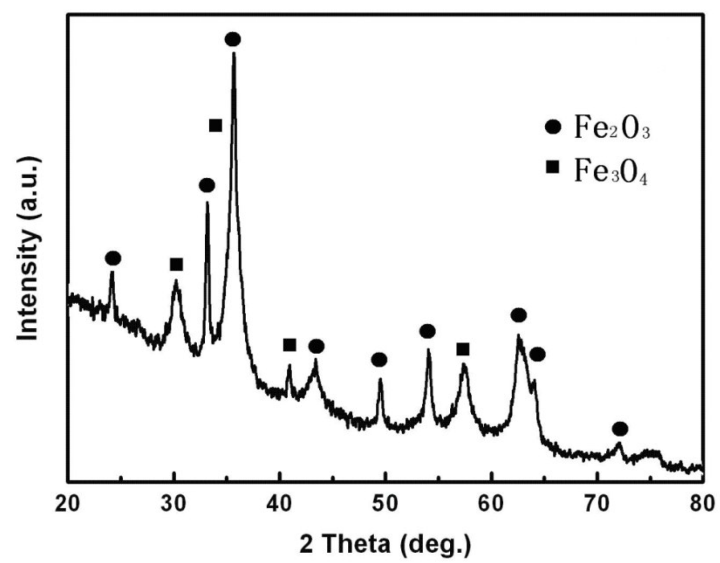

Fig. S1. XRD patterns of Fe-AFs after calcined at 300 °C.

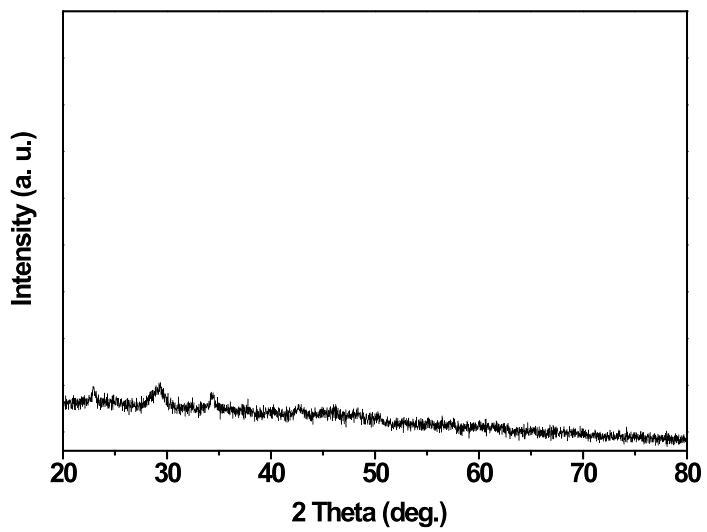

Fig. S2. XRD patterns of Fe-AFs before pyrolyzing. There is no peak of any iron oxide observed. The weak peak at about 28° is from residual $FeCl_3$ (JCPDS No.01-1059) adsorbed at the surface of Fe-AFs[S1].

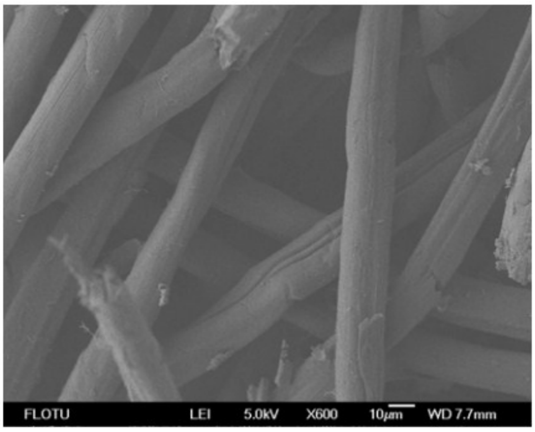

Fig. S3. SEM image of wet-spun ferrum alginate fibers.

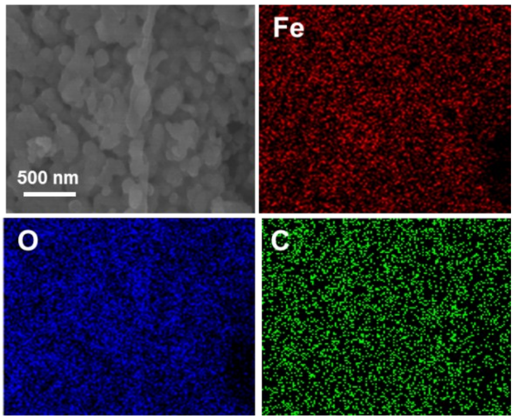

Fig. S4. SEM image and the corresponding element maping of Fe, O and C on the surface of "Fe_2O_3-in-C" material.

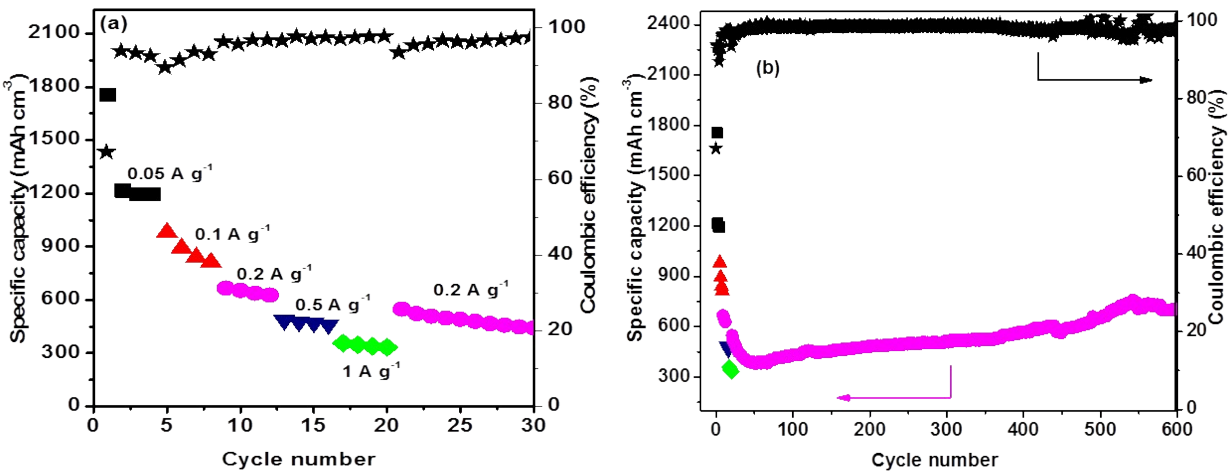

Fig. S5. Electrochemical performance of "Fe_2O_3-in-C" anodes based on tap density. (a) Rate and cycling properties for the first 30 discharge−charge cycles at different current densities. (b) Rate and cycling properties up to 600 discharge−charge cycles.

Table S1 Resistances of the equivalent circuit obtained before and after long-term discharge–charge cycles.

Element	R_s (Ohm)	R_{ct} (Ohm)	CPE_{ct}		R_p (Ohm)	CPE_p		W (10^{-3} * S $s^{0.5}$)
			n	Y_o (10^{-6} * S s^n)		n	Y_o (10^{-6} * S s^n)	
Before cycling	6.16	145	0.708	16.0	--	--	--	2.77
After cycling	5.09	18.4	0.684	232	2.93	0.998	4.25	21.0

The impedance of CPE elements is defined as follows:

$$Z = \left[Y_0 \left(j\omega \right)^n \right]^{-1}, -1 \le n \le 1 \qquad \text{(S1)}$$

where Y_0 is a constant, ω is the angular frequency and n is CPE power. A pure resistance yields n = 0, a pure capacitance yields n = 1, while n = 0.5 represents a Warburg impedance[S2, S3].

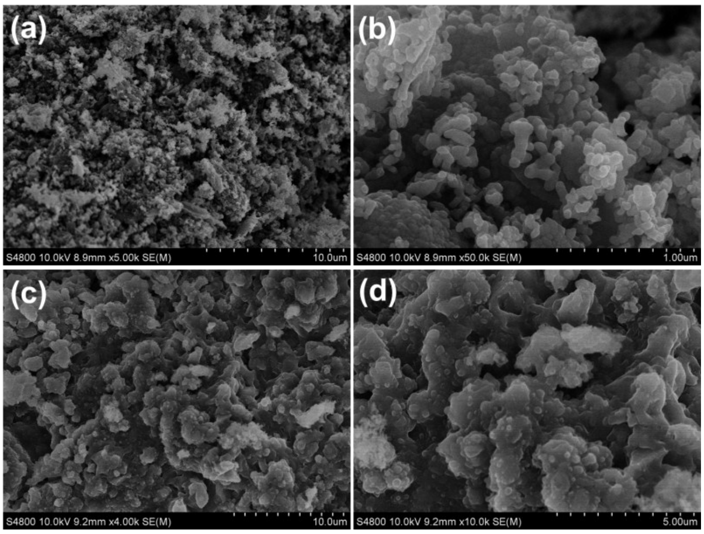

Fig. S6. SEM images of the anode materials (a & b) before and (c & d) after long-term cycling.

Reference

S1. Xin Qi, Jin Qu, Hao-Bin Zhang, Dongzhi Yang, Yunhua Yu, Cheng Chi and Zhong-Zhen Yu, *Journal of Material Chemistry A*, 2015, **3**, 15498–15504.

S1. I. Milošev, M. Metikoš-Huković and H. H. Strehblow, *Biomaterials*, 2000, **21**, 2103–2113.

S2. Mingjie Li, Chenming Liu, Hongbin Cao, He Zhao, Yi Zhang and Zhuangjun Fan, *Journal of Material Chemistry A*, 2014, **2**, 14844–14851.