Supporting Information

Mesoporous Fe$_2$O$_3$ flakes of high aspect ratio encased within a thin carbon skeleton for superior lithium-ion battery anodes
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Fig. S1 TG/DTA curves of the precursor.

Fig. S2 TEM and HRTEM images for additionally showing the polycrystalline structure of Fe$_2$O$_3$, the carbon coating of the 2D-FC (a, b) and the tiny pore inside a single crystal.
Fig. S3 EDX patterns of the precursor (a) and the 2D-FC (b) detected from the corresponding rectangle region of the inset STEM image.

Fig. S4 The appearance of the solutions of acidic 1,10-phenanthroline with the precursor (left) and the 2D-FC (right) dissolved.

Fig. S5 SEM images of the precursor by heating to 350 °C without dwelling showing the particle size distribution (a) and the dense flakes formed on the surface of bulk particles (b); (c) A SEM image of the precursor by heating to 450 °C without dwelling, illustrating the disassembling of the bulk particles formed at 350°C.
**Fig. S6** SEM images of the cross sections of the 2D-FC electrode before (a), and after initial (b) and 10 cycles of (d) lithiation; those of the commercial nano Fe$_2$O$_3$ before (d) and after initial lithiation (e). *Note: as the sample is not fully perpendicular, only the clearly focused area is measured to be the real thickness of the active material layer.

**Fig. S7** SEM images of the 2D-FC electrode material at the states of delithiation (a) and lithiation (b) after 10 cycles.