

Supporting Information

X-ray Fluorescence Mapping: Insights into Mesoscale Impact on Battery Functional Electrochemistry

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X-ray Diffraction Analysis

The crystallite size of the material determined by Rietveld refinement was 50.4(2) nm. The goodness of fit for the Rietveld refinement was acceptable ($R_{wp} = 0.7\%$) and the XRD pattern was consistent with previously reported results,²² indicating the synthesis generated pure Fe_3O_4 material.

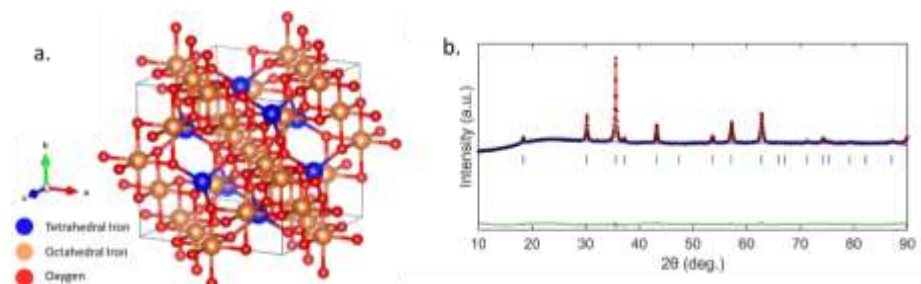


Figure S1. a) Inverse spinel crystal structure of Fe_3O_4 b) XRD pattern (black dots) with theoretical reflection lines of Fe_3O_4 . The calculated fit (red), background (blue) and variance (blue) associated with the Rietveld refinement are shown.

Table S1: Rietveld refinement results for synthesized Fe₃O₄.

Parameter	Value
Space Group	<i>Fd3m</i>
<i>a</i> (Å)	8.3716(1)
Crystallite size (nm) by Rietveld Refinement	50.4(2)
Crystallite size (nm) by Scherrer Equation	30
Microstrain	3.4(2)*10 ³
%Rwp	0.7

Cyclic Voltammetry

Cyclic voltammetry at 0.1 mV/s from 0.5 V to 2.8 V was collected for five cycles to understand the reduction and oxidation mechanisms of planar (**Figure S2a**) and CNT (**Figure S2b**) Fe₃O₄ electrodes.

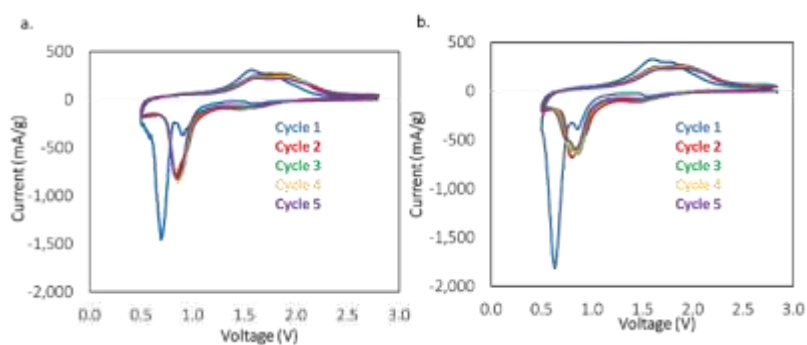


Figure 2: Cyclic voltammetry of (a) planar and (b) CNT Fe₃O₄ electrodes for cycles 1-5 at 0.1 mV/s.