Supporting Information

Dual Defect Discretely Engineered Mn-LFO@N-rGO Nanohybrids for Ultra-sensitive Electrochemical Detection of Ethyl Parathion

S.M. Abhijith[a,b], Rajendran Surya[a,b], Farhana Yasmin Rahman[a,b,c], Subramanian Sakthinathan[a,b*], Te-Wei Chiu[a,b*].

[a]Department of Material and Mineral Resources Engineering, National Taipei University of Technology, No. 1, Section 3, Chung-Hsiao Road, Taipei 106, Taiwan.

[b]Institute of Materials Science and Engineering, National Taipei University of Technology, No.1, Section 3, Chung-Hsiao East Road, Taipei 106, Taiwan.

[c]Thin Film and Nanoscience Laboratory, Department of Physics, Tripura University (Suryamaninagar-799022), Tripura, India.

***Corresponding author:** tewei@ntut.edu.tw (Te-Wei Chiu), sakthinathan1988@gmail.com (S. Sakthinathan)

S 1. Characterization techniques

The sample configuration was examined by X-ray diffraction analysis (XRD) (Bruker XRD, D2 Phaser, Billerica, MA, USA, λ = 1.540 A0). After the XRD studies, the data were analyzed using MDI JADE5.0 software. Field emission scanning electron microscopy (FE-SEM, FEI Quanta FEG 200, H-7600, Hitachi, Tokyo, Japan) operating at a speed of 200 kHz was used to analyze the morphological information. The electrochemical analysis and electrochemical impedance spectroscopy (EIS) were calculated by the CHI 1211B workstations (CH Instruments, Inc., Austin, TX, USA) were linked to a three-electrode electrochemical system, which included an Ag/AgCl electrode as a reference electrode, a GCE as a working electrode and a Pt needle as a counter electrode (BAS Inc., Tokyo, Japan). All the electrochemical experiments were conducted at room temperature in a N_2-purged electrolyte atmosphere.

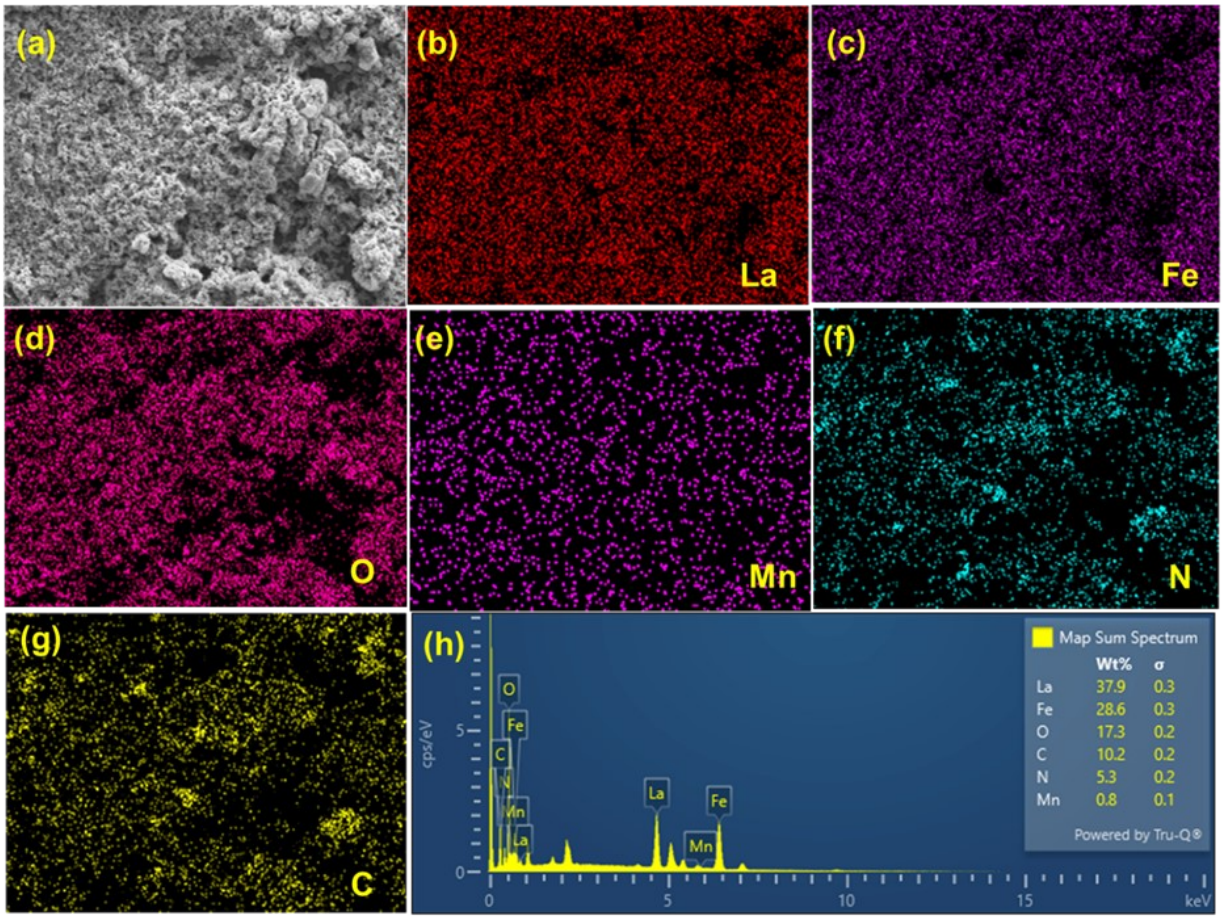

Fig S1. Elemental mapping of the as produced Mn-LFO@N-rGO nanocomposite (a-g), and its EDS analysis (h).

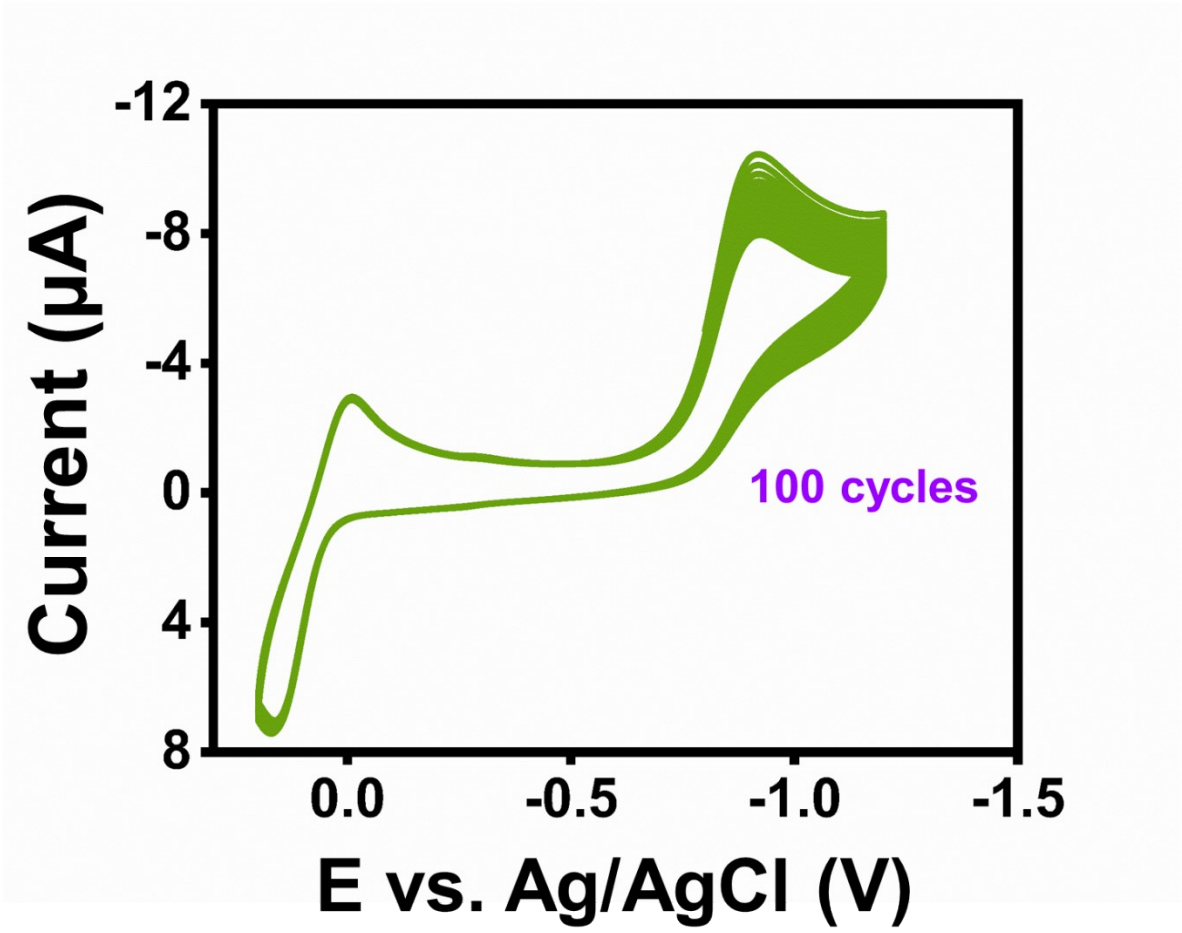

Fig S2. Cyclic stability of Mn-LFO@N-rGO/GCE electrode for 100 continuous repeated cycles.

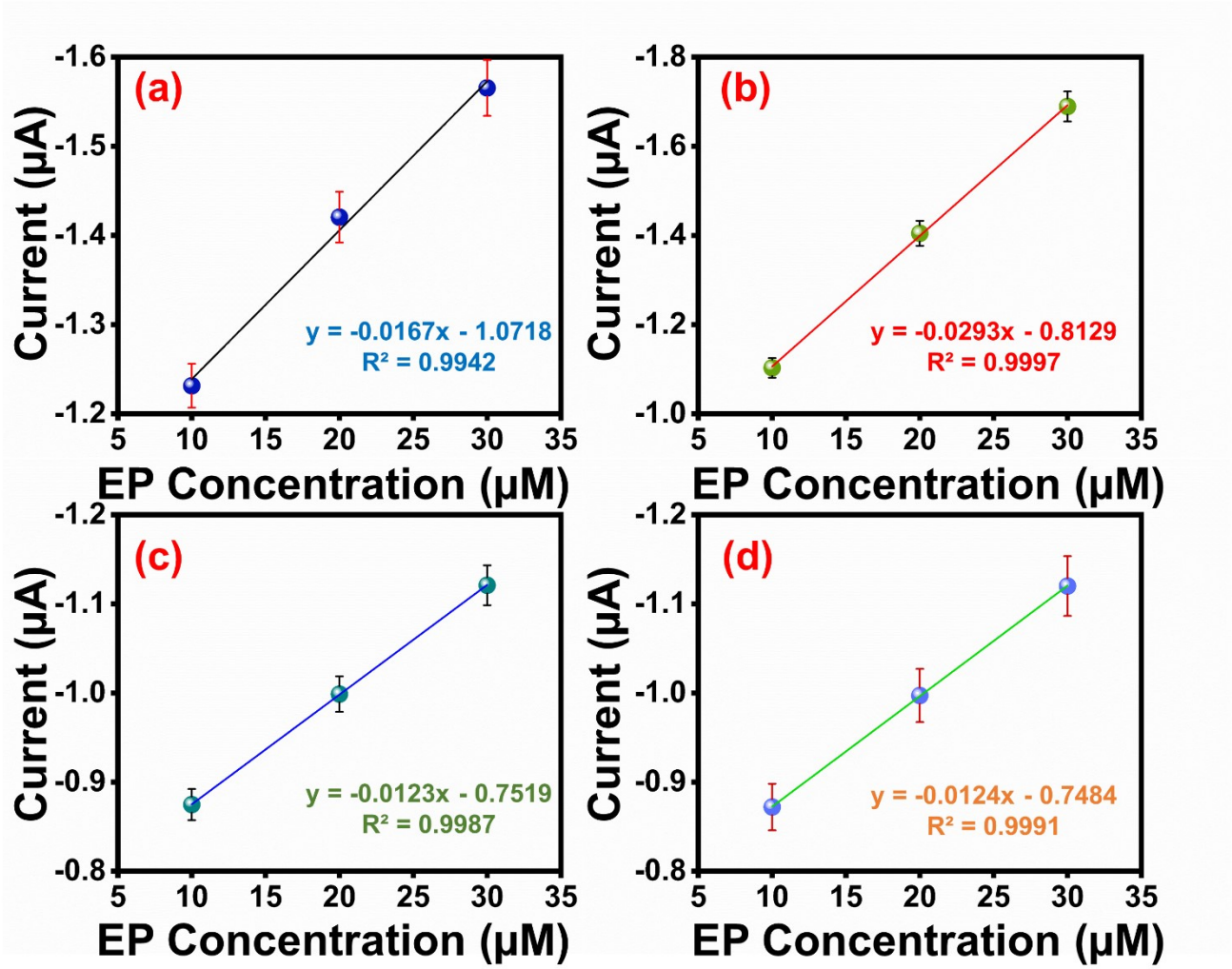

Fig S3. Calibration plot for the real sample analysis of baby corn (a), sunflower oil (b), castor oil (c) and beetroot samples (d).

Table S1. Real sample analysis of EP in baby corn, sunflower oil, castor oil, and beetroot samples with Mn-LFO@N-rGO/GCE electrode.

Sample	Added (µM)	Found (µM)	Recovery(%)	RSD% (n=3)
Baby corn	10	10.03	97.3357	±0.39
	20	20.035	97.2067	±0.45
	30	30.019	98.629	±0.21
	40	40.007	99.532	±0.12
Sunflower Oil	10	10.03	97.45	±0.096
	20	20.05	96.03	±0.075
	30	30.05	96.12	±0.069
	40	40.045	96.56	±0.088
Castor Oil	10	10.22	97.05	±1.2
	20	20.12	97.22	±0.98
	30	30.05	99.35	±0.87
	40	40.15	98.11	±0.52
Beetroot	10	10.02	97.93	±2.35
	20	20.012	98.79	±1.86
	30	30.013	98.79	±1.72
	40	40.013	98.76	±1.37

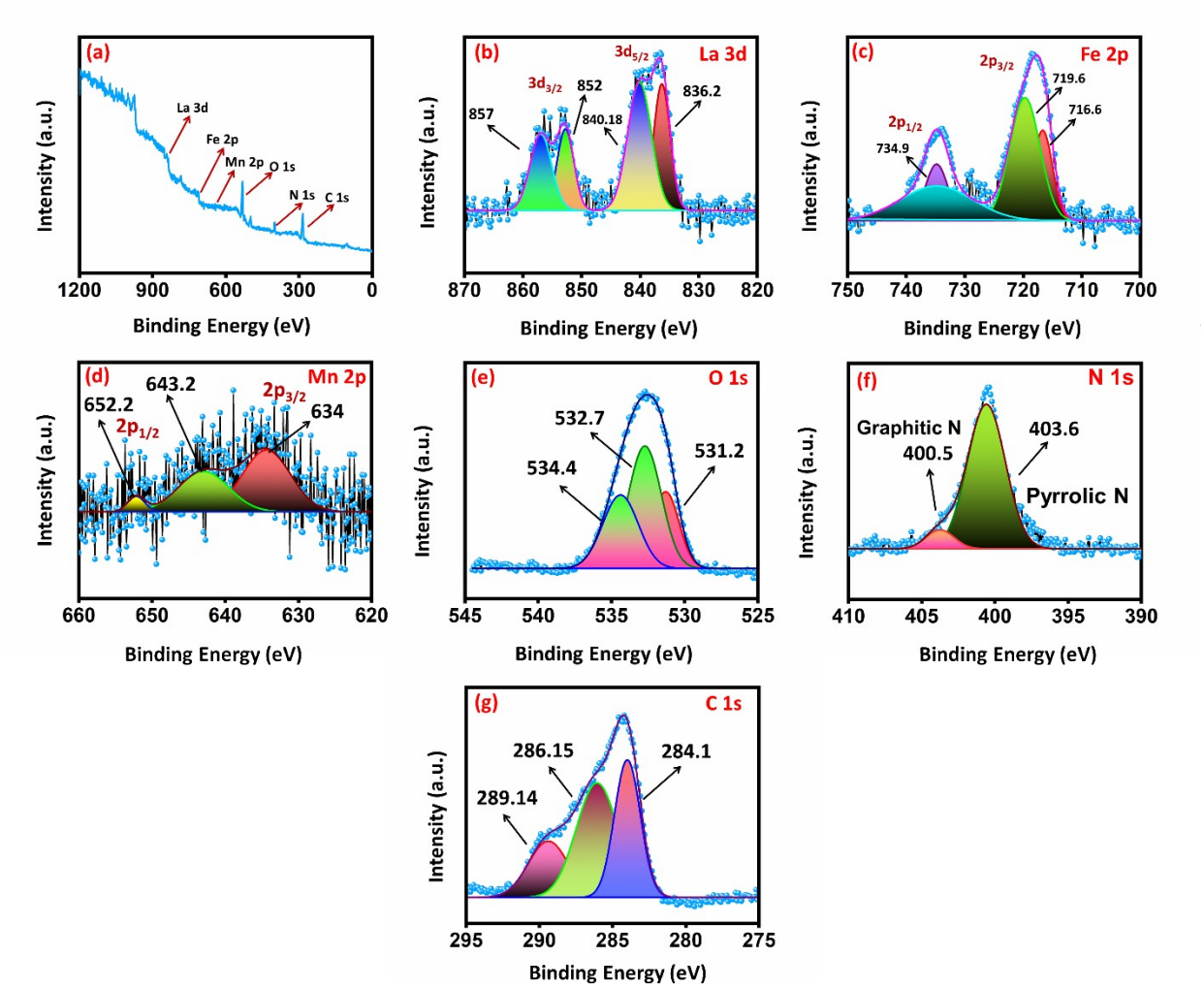

Fig S4. XPS result of Mn-LFO@N-rGO Nanocomposite: (a) Overall XPS survey, (b) La 3d, (c) Fe 2p, (d) Mn 2p, (e) O1s, (f) N 1s, and (g) C 1s.