

# Supporting Information

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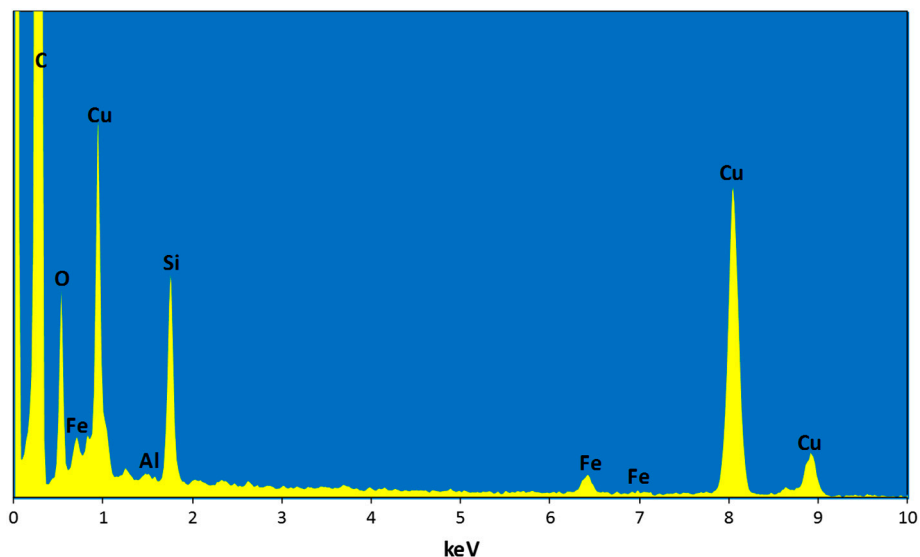


Fig. S1. Energy-dispersive X-ray spectroscopy point analysis of impurity in natural graphite (as in Fig. 2A of the main text) confirms the presence of Fe impurities.

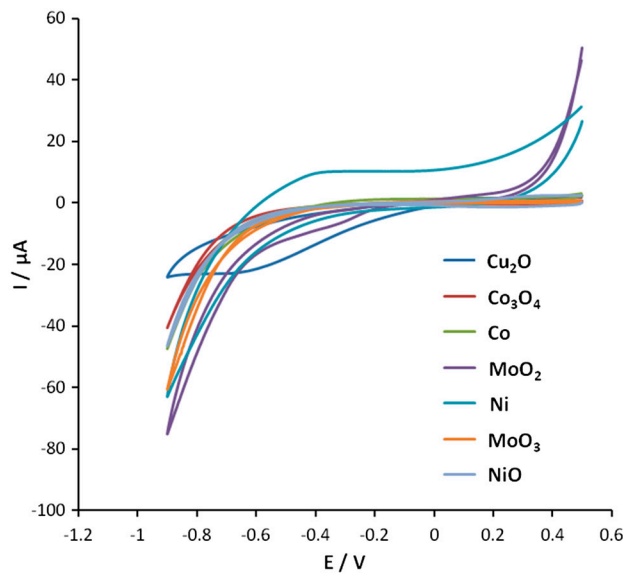
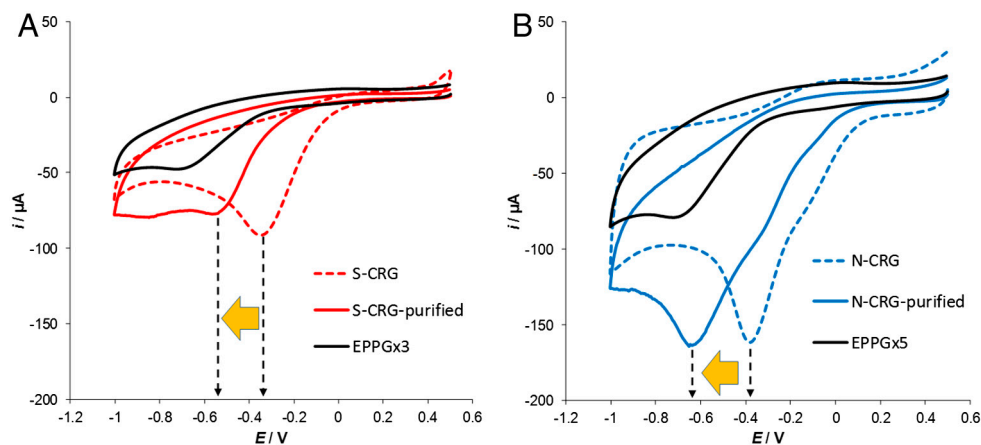


Fig. S2. Cyclic voltammograms recorded in the presence of 10 mM cumene hydroperoxide using glassy carbon electrode modified with  $\text{MoO}_2$ ,  $\text{MoO}_3$ ,  $\text{Co}$ ,  $\text{Cu}_2\text{O}$ ,  $\text{Ni}$ ,  $\text{NiO}$ , and  $\text{Co}_3\text{O}_4$  nanoparticles. Supporting electrolyte, 50 mM phosphate buffered solution at pH 7.2. Scan rate, 0.1 V/s. Reference electrode,  $\text{Ag}/\text{AgCl}$ .



**Fig. S3.** Cyclic voltammograms recorded in the presence of 10 mM cumene hydroperoxide using glassy carbon electrode modified with chemically reduced graphene obtained from (A) synthetic graphite (S-CRG) and (B) natural graphite (N-CRG) before (dashed line) and after (solid line) thermal-purification treatment. Supporting electrolyte, 50 mM phosphate buffered solution at pH 7.2. Scan rate, 0.1 V/s. Reference electrode, Ag/AgCl.

**Table S1. Metallic-impurities content in chemicals used in the preparation of chemically reduced graphene materials as determined by inductively coupled plasma mass spectrometry analysis**

	Element concentration (ppb)					
	Fe	Co	Cu	Mo	Ni	Zn
HNO <sub>3</sub> (5%)	<DL	<DL	<DL	<DL	<DL	<DL
H <sub>2</sub> SO <sub>4</sub> (5%)	<DL	<DL	<DL	<DL	<DL	<DL
Hydrazine (5%)	<DL	<DL	<DL	<DL	<DL	<DL
H <sub>2</sub> O <sub>2</sub> (5%)	39.85	0.1233	0.2608	1.573	0.2608	0.401

DL, detection limit; ppb, parts per billion.

**Table S2. Metallic impurities content in graphite oxide samples prepared from synthetic (S-GO) or natural (N-GO) graphite after 2-h ultrasonication treatment as determined by inductively coupled plasma mass spectrometry analysis**

	Element concentration (ppm)				
	Fe	Co	Cu	Mo	Ni
S-GO sonicated	31.81	0.04	1.67	1.78	2.61
N-GO sonicated	983.6	0.45	8.22	1.74	12.96