Electronic Supporting Information

Graphene oxide reduction by standard industrial reducing agent: Thiourea dioxide.

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Section 1: Experimental details

The reduction of Graphite-Ox with thiourea dioxide was investigated over a 1, 2, 5, 10 and 20 hours reaction. A control reaction with Graphite-Ox heated under hot caustic alkali solution, without any addition of thiourea dioxide was ran simultaneously for 2 hours. The results from the 1 hour reaction were reported in the main manuscript and the remaining samples are reported here in the supporting information.

In accordance with the reaction time, the samples were named as T2-CRGO for 2 hour reaction, T5-CRGO for 5 hour reaction etc. The control reaction was labelled as NaOH control.

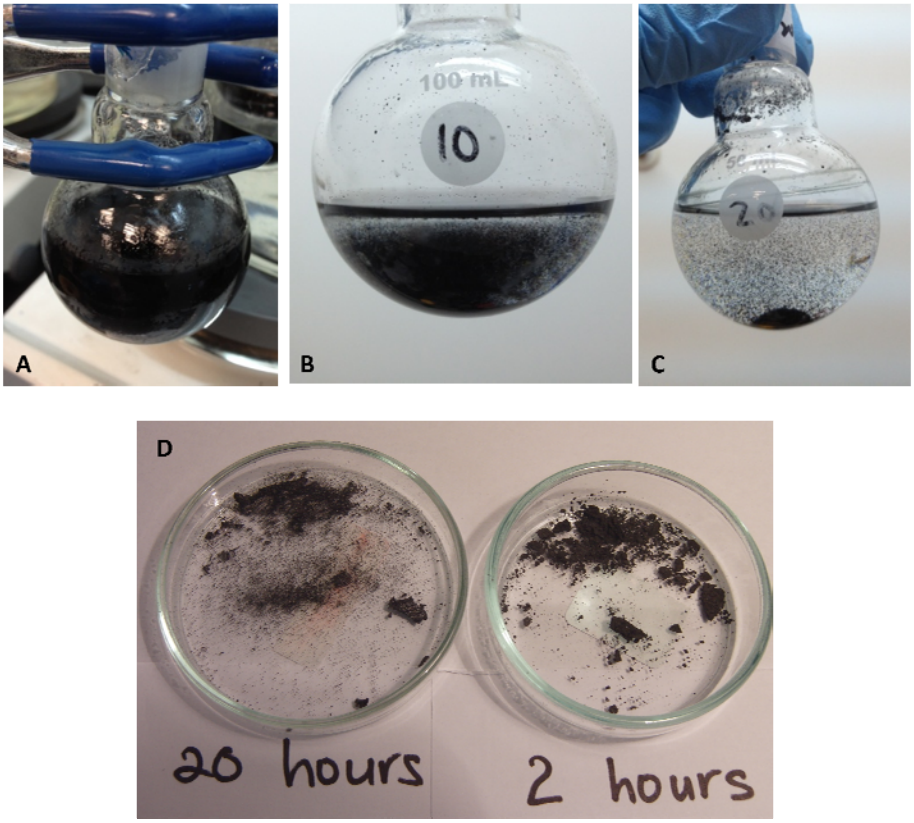

Fig. S1 Photographs of reaction mixture upon completion of (A) 2 hours (B) 10 hours (C) 20 hours reaction time. (D) solid samples of 2 and 20 hours of reaction time.

Section 2: Characterisations

Section 2.1 Morphological Characterisations

Transmission Electron Microscopy (TEM)

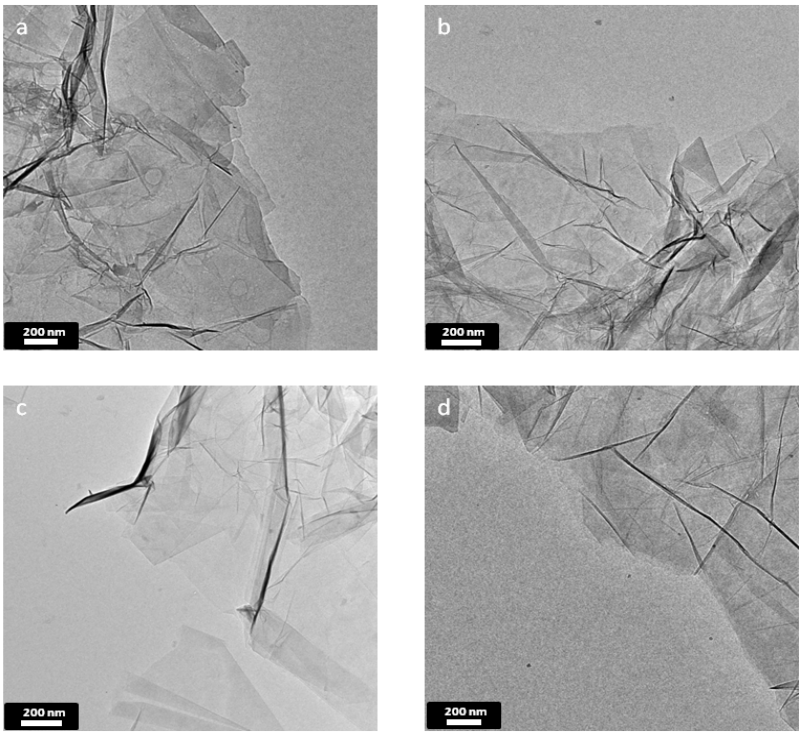

Fig. S2 TEM images of (a) T2-CRGO (b) T5-CRGO (c) T10-CRGO (d) T20-CRGO.

Scanning Electron Microscopy (SEM)

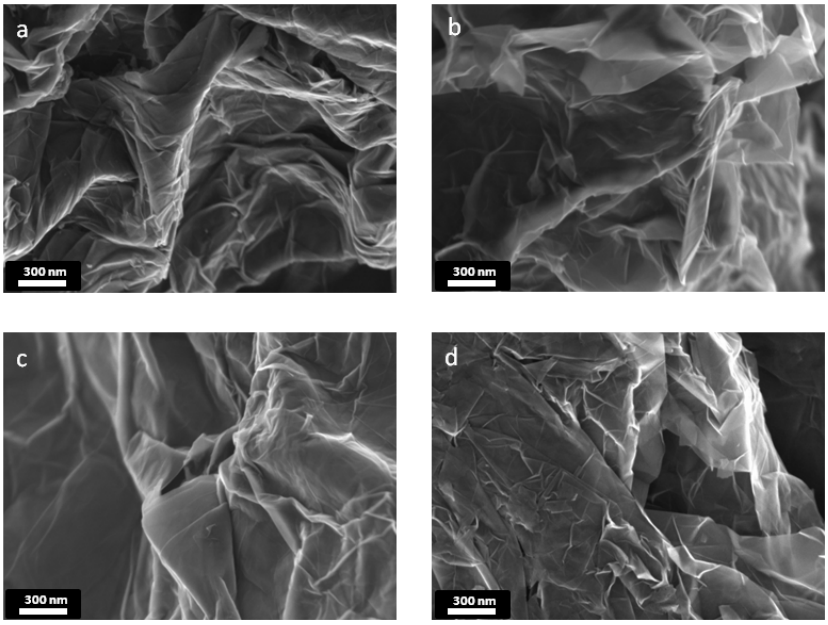

Fig. S3 SEM images of (a) T2-CRGO (b) T5-CRGO (c) T10-CRGO and (d) T20-CRGO.

Section 2.2 Structural Characterisations

X-ray Photoelectron Spectroscopy (XPS)

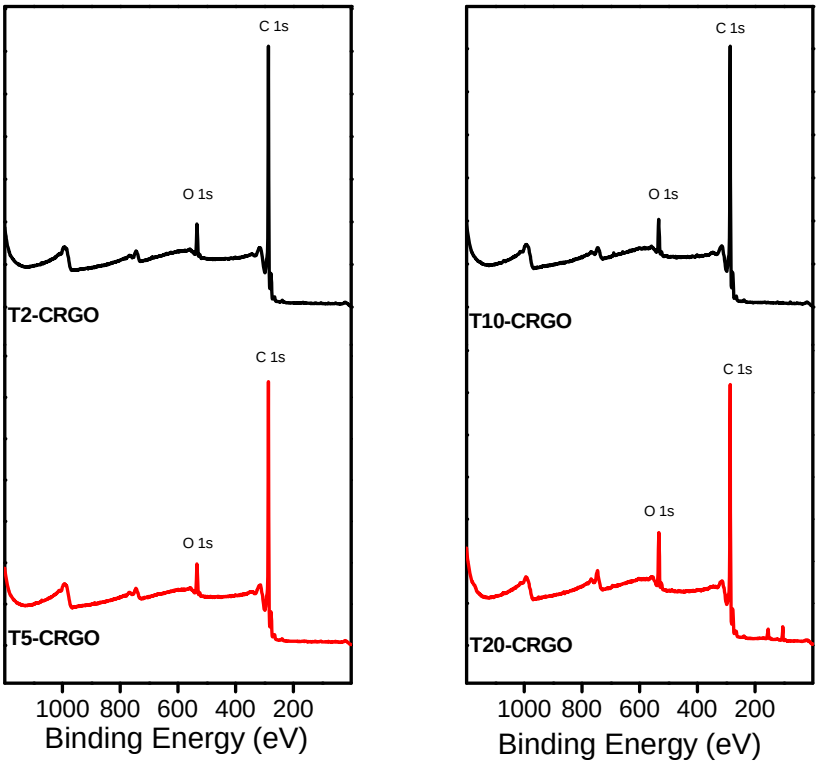

Fig. S4 XPS wide scan spectra of T2-CRGO, T5-CRGO, T10-CRGO and T20-CRGO.

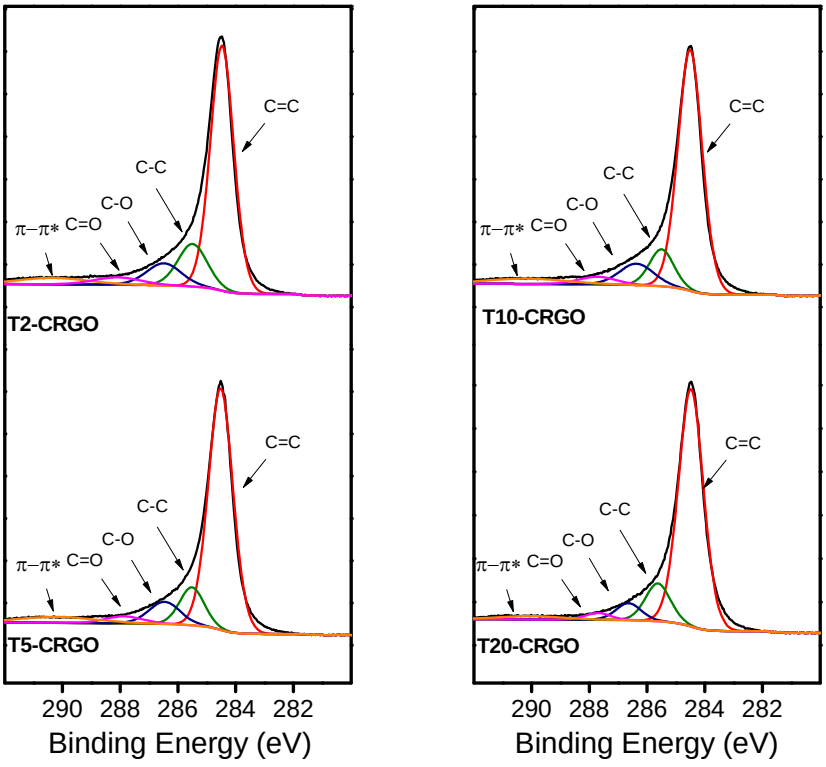

Fig. S5 XPS C1s core level spectra of T2-CRGO, T5-CRGO, T10-CRGO and T20-CRGO.

Raman Spectroscopy

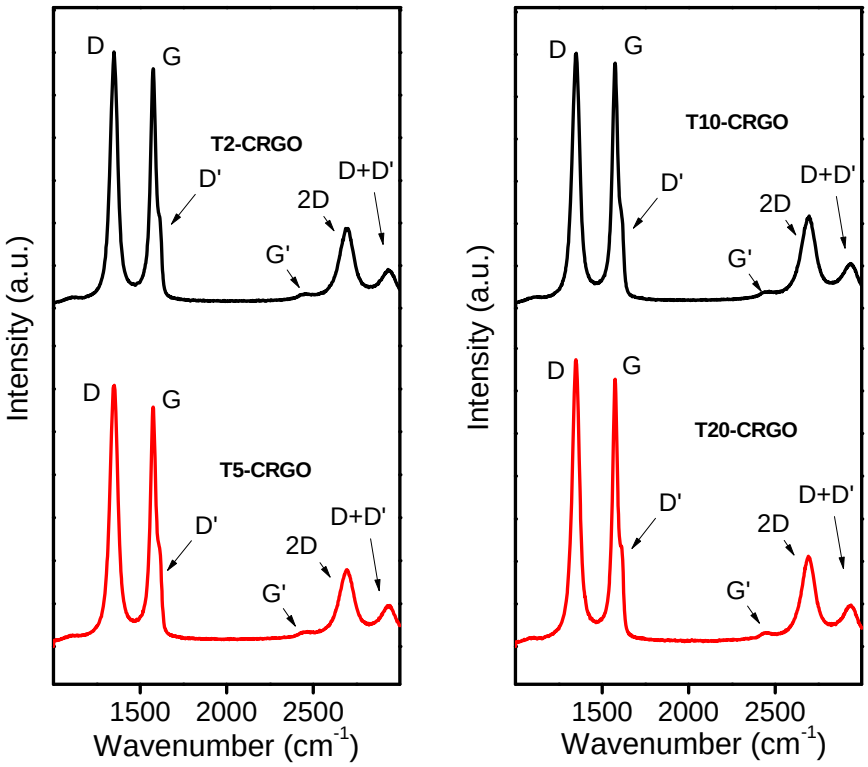

Fig. S6 Raman spectra of T2-CRGO, T5-CRGO, T10-CRGO and T20-CRGO.

Section 2.3 Electrochemical Characterisations

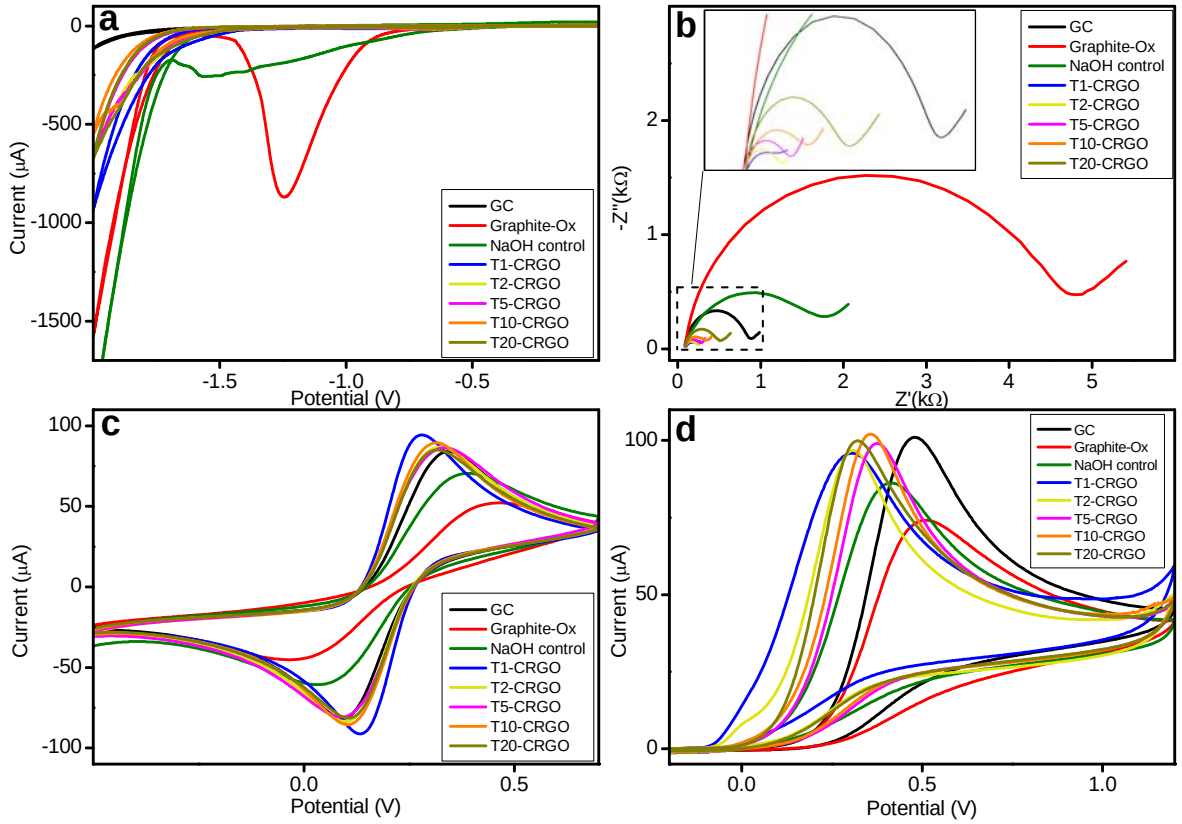

Fig. S7 Electrochemical characterisations of GC, Graphite-Ox, NaOH control, T1-CRGO, T2-CRGO, T5-CRGO, T10-CRGO, T20-CRGO: (a) Cyclic voltammetric profiles of electrochemical reduction of oxygen containing groups. Conditions: PBS 50 mM, pH 7.2 background electrolyte. Scan rate: 100 mV s^{-1}. (b) Nyquist diagrams for EIS measurements. Conditions: PBS 50 mM pH 7.2 background electrolyte, 10 mM $K_3[Fe(CN)_6]/K_4[Fe(CN)_6]$. (c) Cyclic voltammograms on ferro/ferricyanide. Conditions: PBS 50 mM pH 7.2 background electrolyte, 10 mM $K_3[Fe(CN)_6]/K_4[Fe(CN)_6]$. Scan rate: 100 mV s^{-1}. (d) Cyclic voltammograms on ascorbic acid. Conditions: PBS 50 mM pH 7.2 background electrolyte, 5 mM ascorbic acid. Scan rate: 100 mV s^{-1}.