

Supporting Information

Synthesis Procedure: Graphene oxide (GO) was prepared by a modified Hummers method using expandable graphite flakes as the starting material. Graphite flakes (1 g) were first ground along with NaCl (50 g) for 10 min and then NaCl was dissolved in water and removed by filtration; this step ensures the removal of any hetero-atomic contaminants. The remaining graphite flakes (now ~0.85 g) were then mixed in 23 mL of 98% H₂SO₄ and the mixture was stirred for 8 h. Subsequently, KMnO₄ (3 g) was gradually added while keeping the temperature below 20 °C. The mixture was then stirred at 35–40 °C for 30 min, and then at 65–80°C for 45 min. Next, water (46 mL) was added and the mixture was heated at 98–105 °C for 30 min to allow the reactants to react. The reaction was terminated by adding distilled water (140 mL) and 30% H₂O₂ (10 mL). So-prepared mixture was washed with 5% HCl aqueous solution and then with distilled water by repeated centrifugation and filtration to obtain GO, which was then spread over a petri dish and sunlight was focussed on to it using a simple converging lens leading to the formation of SRGO owing to photo-thermal reduction and simultaneous exfoliation of GO [R1].

Characterization Experiments: Field emission scanning electron microscope (FESEM, Model Zeiss Ultra 55) and transmission electron microscope (TEM, Model FEI Technai G2 S-Twin) are used to study the morphology of SRGO; they were operated at accelerating voltages of 5 and 200 kV, respectively. X-ray diffraction (XRD) and micro Raman scattering studies are carried out to understand the difference between phase information of GO and SRGO. XRD patterns are recorded with 2θ (where θ is the Bragg's diffraction angle) in the range 5-50° using Cu K α as the X-ray source ($\lambda=1.54 \text{ \AA}$); Bruker's AXS Model D8 Advance System was used to carry out the XRD experiments. Raman scattering from GO and SRGO was recorded with a spectral resolution of 1 cm⁻¹ using LabRam HR800 Raman spectrometer; 514.5 nm Ar⁺ ion laser was used as the excitation source.

Various Characteristics of SRGO in Comparison to GO: Plane view secondary electron micrographs of SRGO recorded at different magnifications as shown in Fig. S1 depict crumpled sheets. Even FESEM image shown Fig. 1(b) indicates that the sheets are transparent to electrons. TEM images at different magnifications shown in Figs. S2(a) and (b) not only confirm the crumpled nature of the sheets but also confirm the transparency of the sheets to electrons. The typical high resolution TEM image (Fig. S2(c)) shows layered nature of SRGO. The typical electron diffraction pattern indicative of co-existence of amorphous and layered nature of carbon in SRGO is shown in Fig. S2(d).

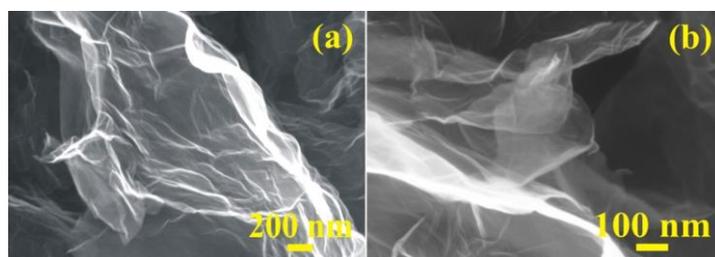


Figure S1. Plane view secondary electron micrograph of SRGO (a,b).

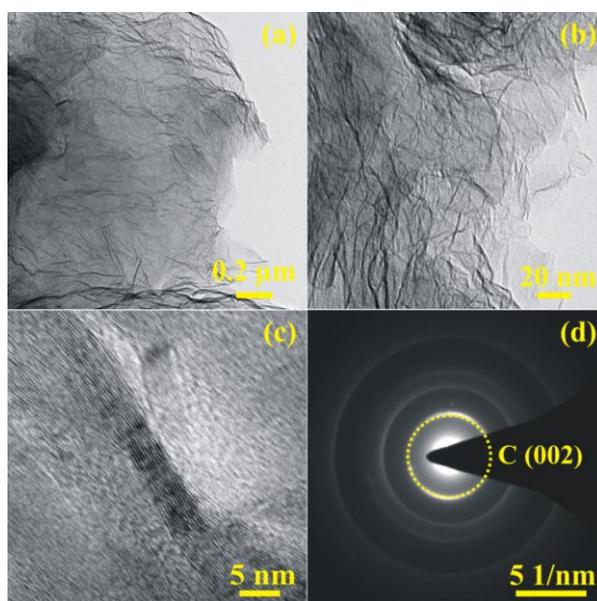


Figure S2. (a) and (b) TEM images (c) high resolution TEM image and (d) representative electron diffraction pattern of SRGO.

XRD patterns of GO and SRGO are given in Fig. S3. The crystal structure of graphite is very simple and only one X-ray diffraction peak should be observed in its natural state. This peak has an intensity maximum at a diffraction angle of $\sim 26^\circ$ which corresponds to the characteristic

(002) reflection from the parallel graphene layers in graphite. If the graphite is oxidized, the peak at $\sim 26^\circ$ does not appear while another peak appears which has an intensity maximum at $\sim 11.2^\circ$ which is related to the partial reduction of oxidized graphite [R2]. In the present case, this peak has greater intensity in the case of SRGO indicating that the reduction of GO using sunlight is good. GO forms owing to the reaction between graphite and KMnO_4 . As this happens the distance between the graphene layers in graphite increase owing the attachment of oxygen containing groups, some to the basal planes and some to the edges. In the subsequent step i.e., during the reduction of GO the attached oxygen containing groups will be released resulting in the reduction of spacing between graphene layers (along c-axis) in SRGO in comparison to GO. As shown in Fig. S4, GO and SRGO samples display two prominent peaks at 1334 and 1596 cm^{-1} , corresponding to the well-documented D and G bands, respectively [R3]. Compared with GO an increased I_D/I_G intensity ratio for the SRGO is observed, indicating a decrease in the size of the in-plane sp^2 domains and the removal of the oxygen functional groups from GO. The intensity of D band is higher due to the defects and partially disordered structure of the SRGO [R3].

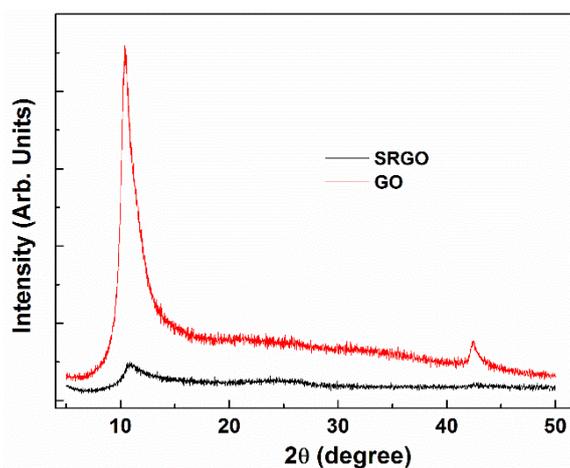


Figure S3. XRD patterns of GO and SRGO.

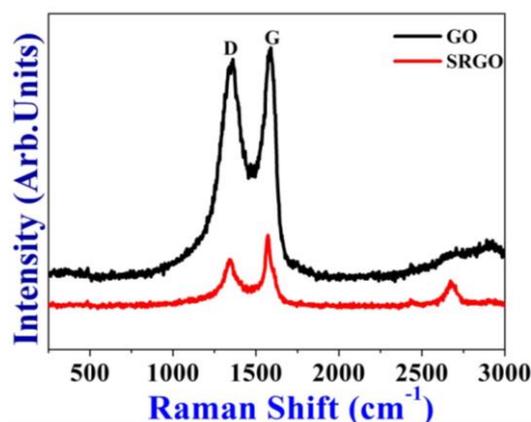


Figure S4. Raman spectra of GO and SRGO.

BET surface areas and pore size distributions of GO and SRGO are shown in **Fig. S5**. The isotherms of the samples reveal type IV characteristic isotherm. The hysteresis loop is found in the relative pressure range of 0.4-0.9 which confirms that N₂ is adsorbed on graphene nanosheets. BET surface areas of GO and SRGO are 51.3 and 107.5 m²/g, respectively. The pore size distribution plots indicate meso-porosity (pore sizes in the range 10-50 nm).

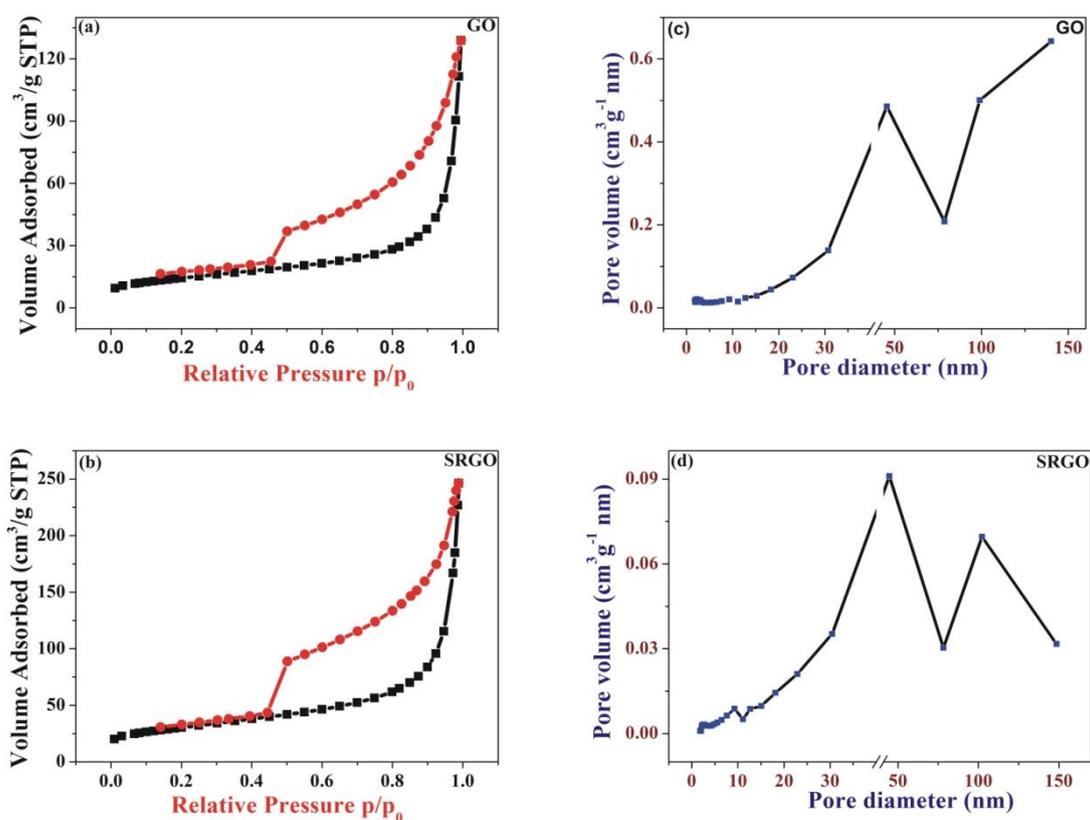


Figure S5. (a), (b) N₂ adsorption/desorption isotherms and (c), (d) pore size distribution curves of GO, SRGO and respectively.

[R1] S.-F. Pei, H.-M. Cheng, The reduction of graphene oxide, *Carbon* 50(9) (2012) 3210–3228.

[R2]. Shaikshavali Petnikota, N. K. Rotte, Vadali V. S. S. Srikanth, B. S. R. Kota, M. V. Reddy, K. P. Loh, B. V. R. Chowdari, Electrochemical studies of few-layered graphene as an anode material for Li ion batteries, *J. Solid State Electrochem.* 18(4) (2014) 941–949.

[R3]. A. C. Ferrari, Raman spectroscopy of graphene and graphite: Disorder, electron–phonon coupling, doping and nonadiabatic effects, *Solid State Commun.* 143 (2007) 47–57.