Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supplementary information

Synthesis of graphene oxide (GO)

Graphene oxide (GO) had been synthesized by the reaction of the graphite flake and oxidizing agents by Hummer's method. Firstly, graphite flake (500 mg) and sodium nitrate (500 mg) were added in concentrated sulphuric acid (12.5 ml) and stirred for 2 h in ice bath at the temperature of 0-5^{o}C. Potassium permanganate (1.5 g) was then added to the mixture slowly, while controlling temperature up to 15^{o}C. The as-prepared mixture was agitated for 48 h in ambient temperature to attain the maximum possible oxidation of graphite. Deionized water was then added to the thick slurry obtained at room temperature. Further hydrogen peroxide (2.5 ml) was added to discontinue the reaction. By addition of hydrogen peroxide, the color of the reaction mixture quickly changed to yellow signifying the oxidation of graphite. The reaction mixture was then washed several times with 10% hydrochloric acid solution and deionized water until the neutral pH is obtained. The suspension was discharged to a petri dish at ambient temperature to obtain dried sheet of GO.

Figure S1-S3 show the CV curves of MnO_2, SRGO and SRGO-MnO_2 at several scan rates. All the CV curves manifested quasi-rectangular shape indicating the electrical double layer (EDL) behavior along with the contribution of faradaic redox reaction for charge storage. For each material, the current response was higher at elevated scan rates, indicating superior electrochemical performance.

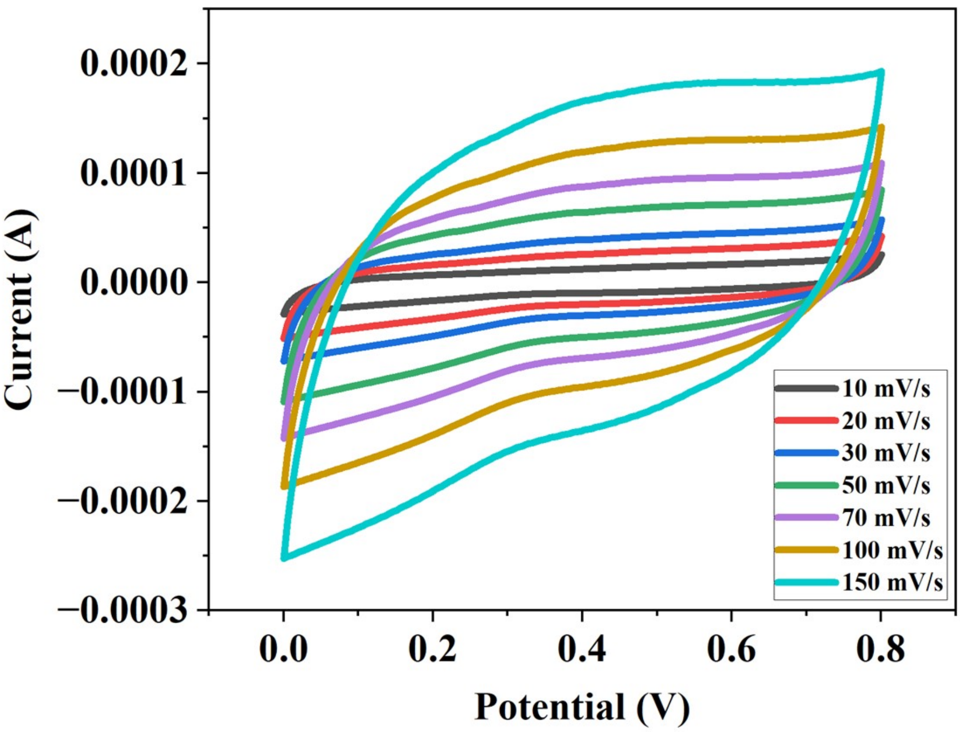

Figure S 1. CVs at various scan rates for MnO_2

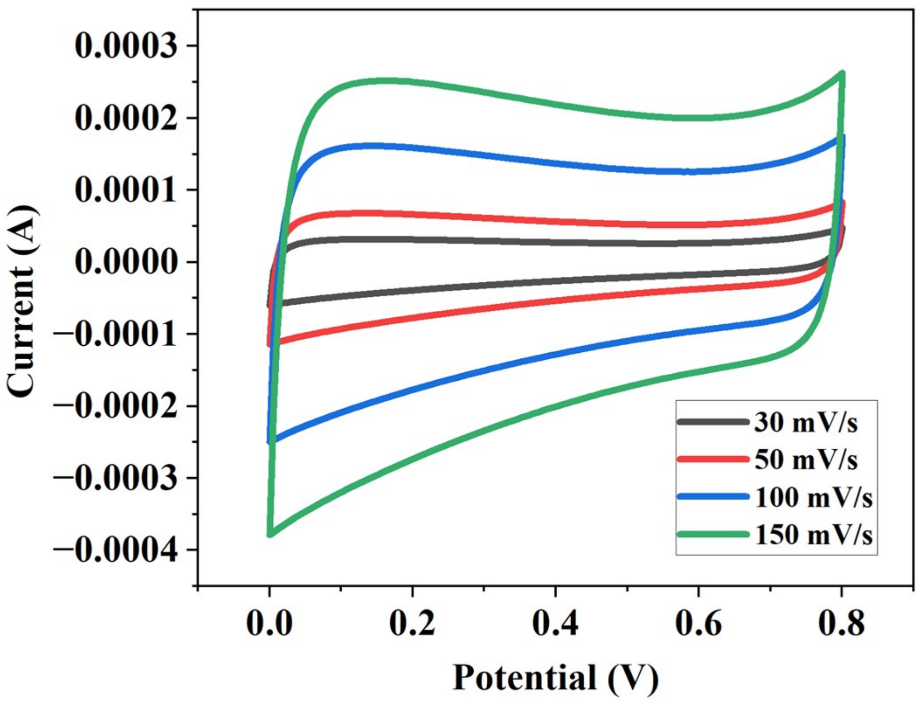

Figure S 2. CVs at various scan rates for SRGO

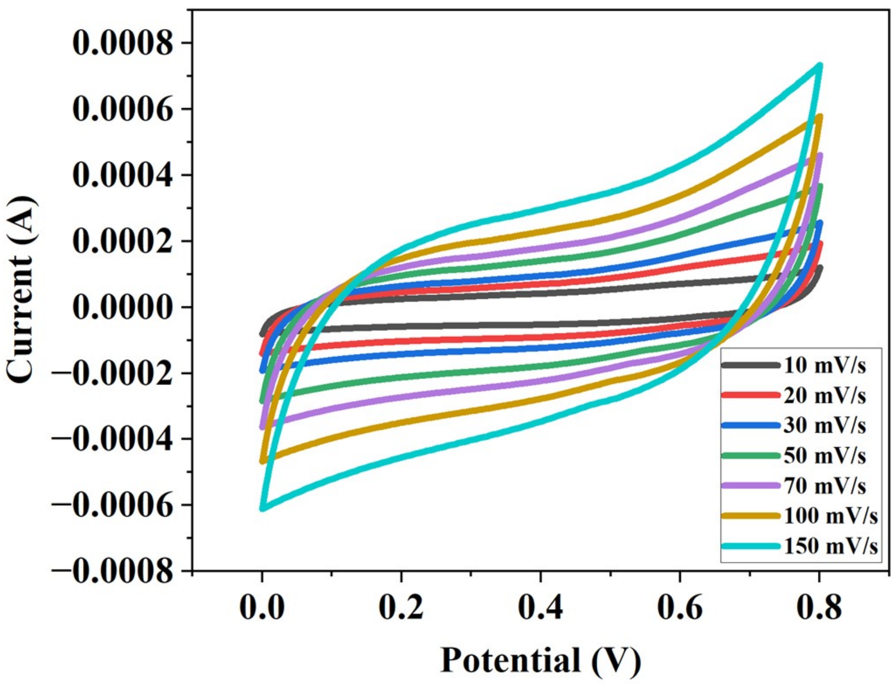

Figure S 3. CVs at various scan rates for SRGO-MnO_2 composite

Figure S4-S6 displays GCD curves for MnO_2, SRGO and SRGO-MnO_2 at different current densities. The GCD curves for the three materials show symmetric triangular shape, which suggest EDL behaviour of charge storage. With the increase in current density, the discharge time decreases, and thus the specific capacitance. The decrease in specific capacitance was attributed to the less diffusion of electrolyte ions in the porous structure of the materials at elevated current densities [1].

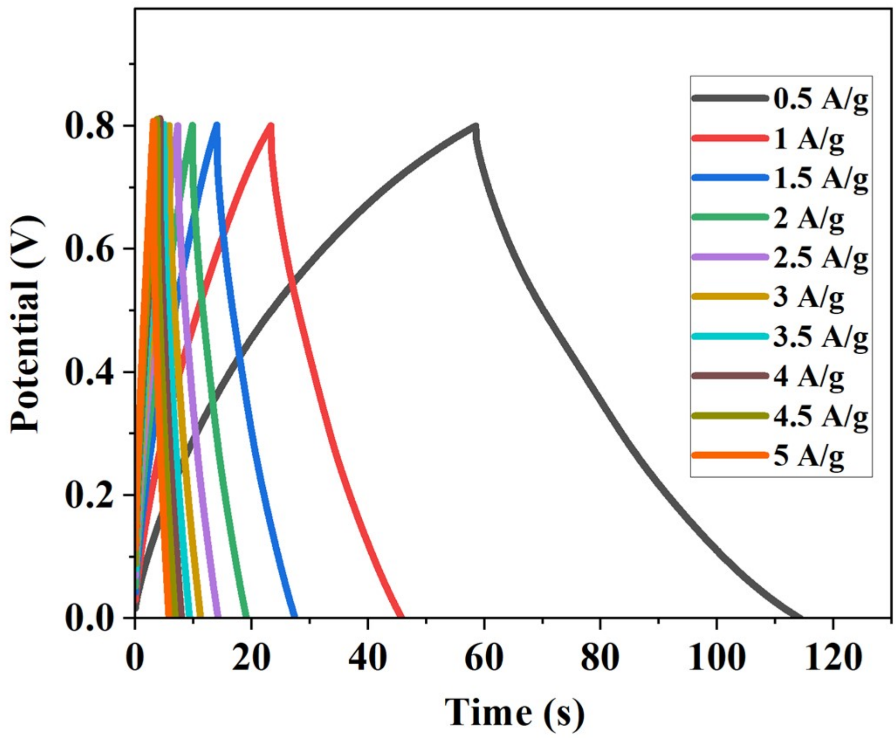

Figure S 4. GCDs at various current densities for MnO_2

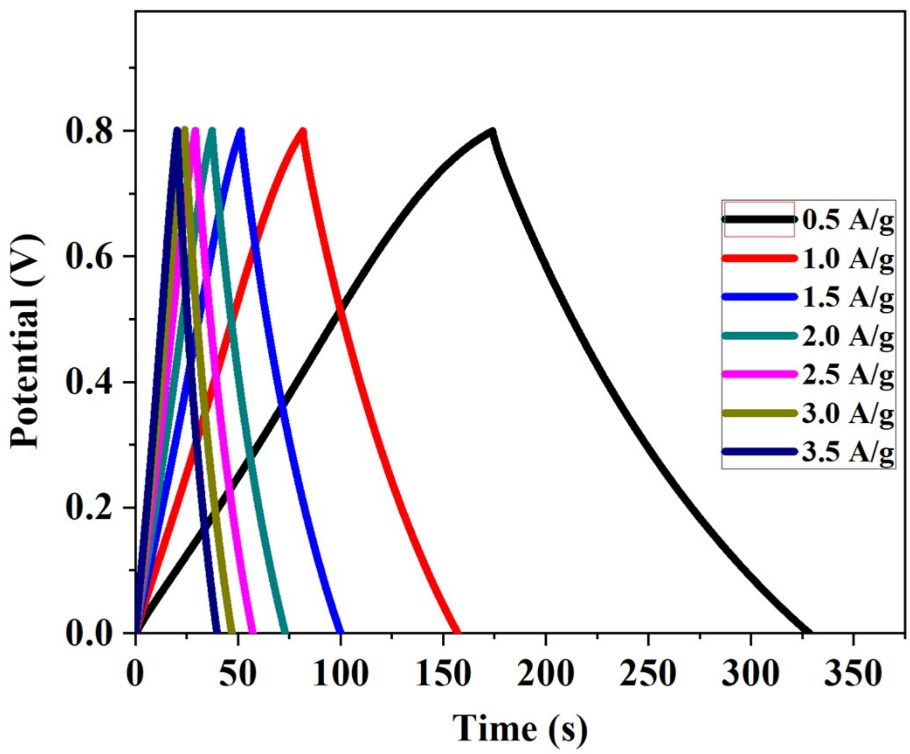

Figure S 5. GCDs at various current densities for SRGO

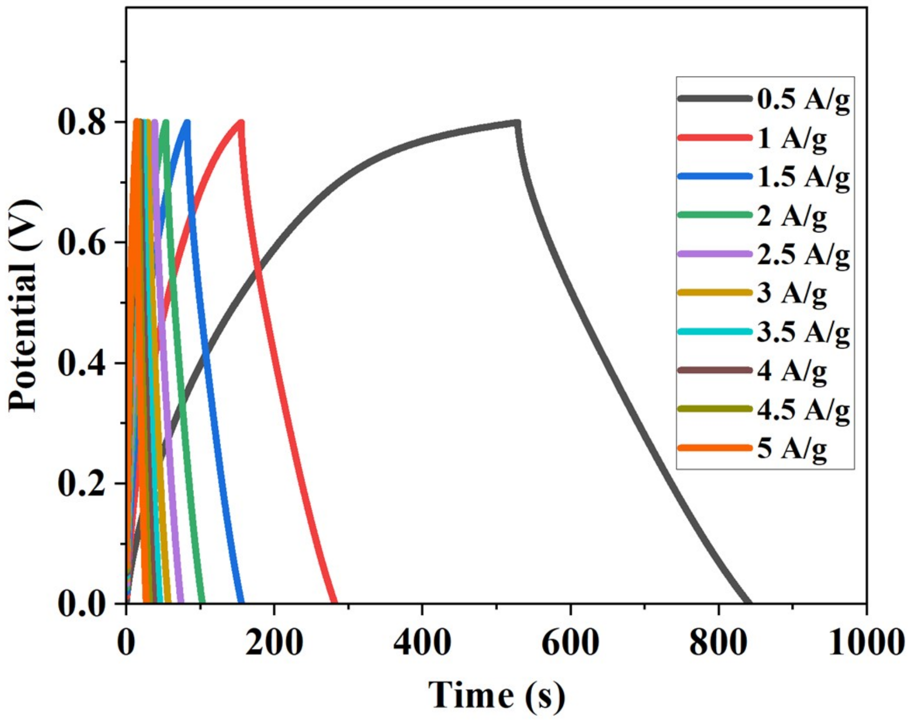

Figure S 6. GCDs at various current densities for SRGO-MnO_2 composite

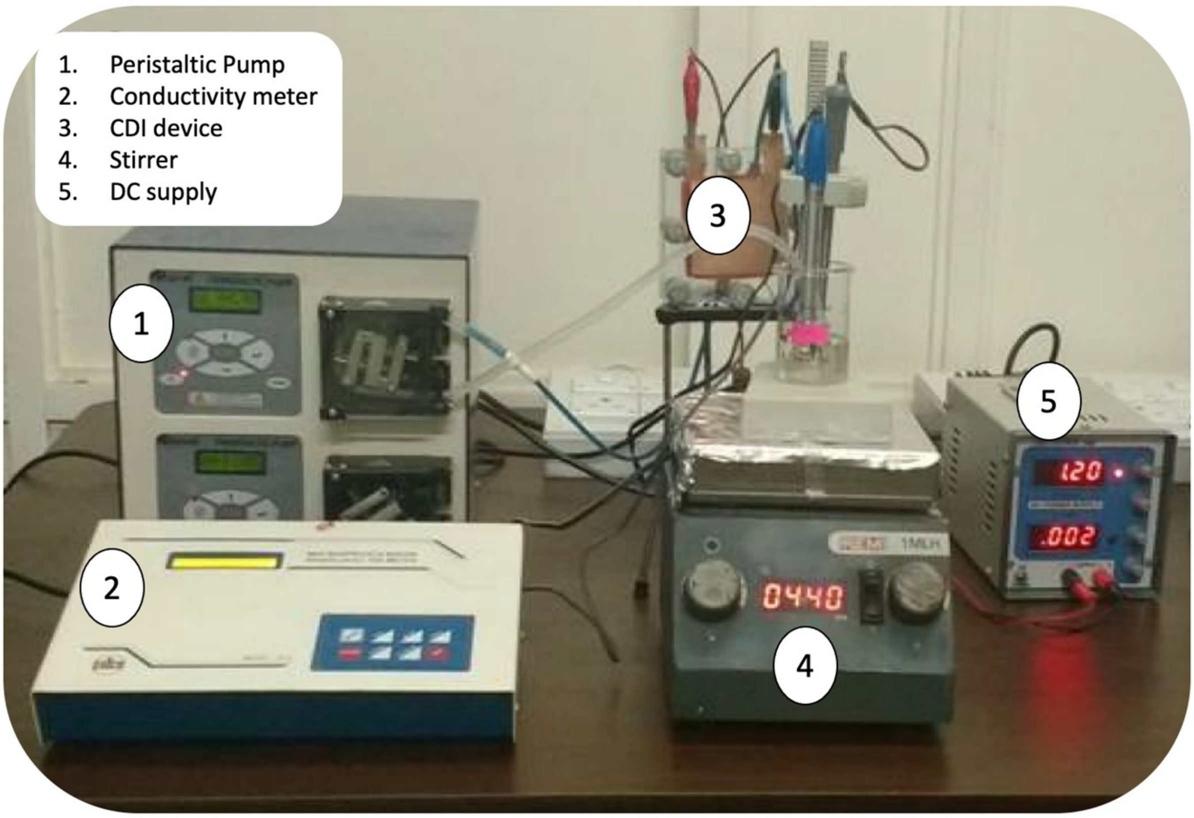

Figure S 7. Actual photograph of CDI experimentation

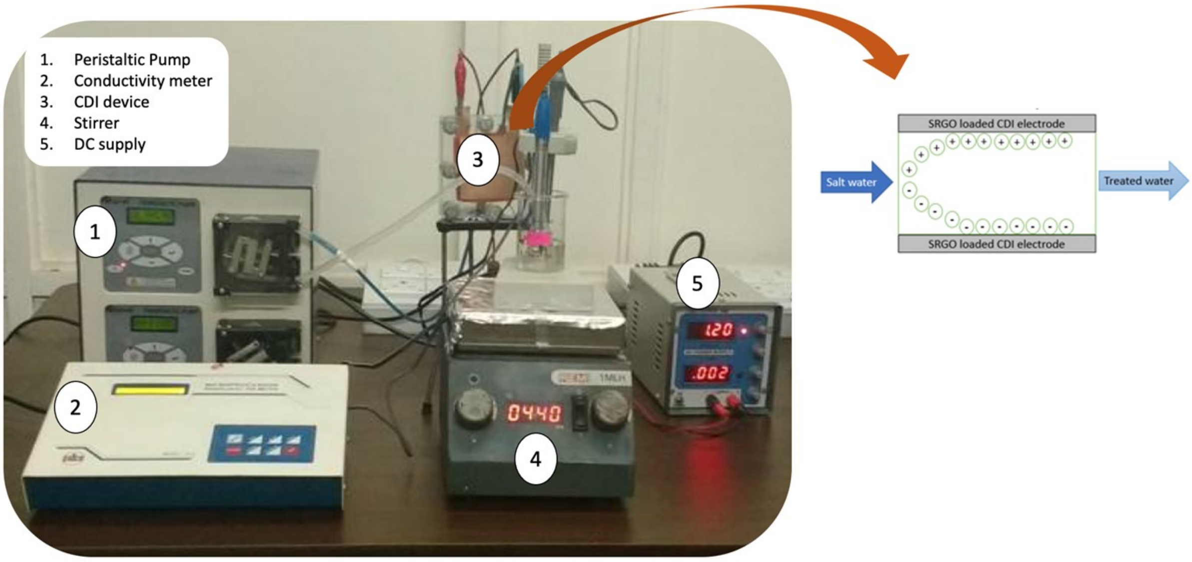

Figure S 8. Schematic diagram along with the CDI mechanism using symmetric electrode configurations

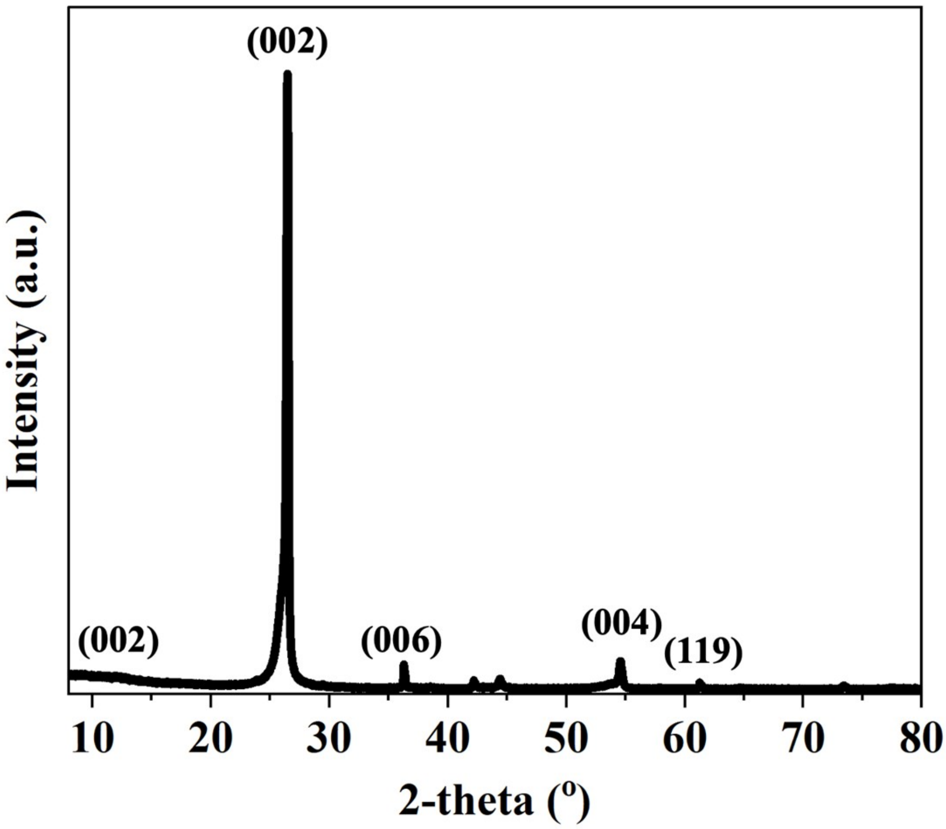

Figure S 9. XRD pattern of the CDI electrode after electrosorption experiment

Reference

[1] D. J. Ahirrao, S. Tambat, A. B. Pandit, and N. Jha, “Sweet-Lime-Peels-Derived Activated-Carbon-Based Electrode for Highly Efficient Supercapacitor and Flow-Through Water Desalination,” *ChemistrySelect*, vol. 4, no. 9, pp. 2610–2625, 2019, doi: 10.1002/slct.201803417.