Supporting Information

Improved performance of electric double layer capacitor using redox additive (VO^{2+}/VO_2^{+}) aqueous electrolyte

S. T. Senthilkumar,[†] R. Kalai Selvan,[†*] J. S. Melo,[‡] Y. S. Lee,[§] and N. Ponpandian[ξ]

[†] *Solid State Ionics and Energy Devices Laboratory, Department of Physics, Bharathiar University, Coimbatore- 641046, Tamil Nadu, India*

[‡] *Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Centre, Trombay, Mumbai-400085, India*

[§] *Faculty of Applied Chemical Engineering, Chonnam National University, Gwangju 500-757, Korea*

[ξ] *Department of Nanoscience and Technology, Bharathiar University, Coimbatore- 641046, Tamil Nadu, India*

Gel polymer electrolyte used EDLC fabrication:

The PVA/$VOSO_4$/H_2SO_4 gel polymer was prepared using optimal $VOSO_4$ (0.3 g) added 1 M H_2SO_4 electrolyte. In detail, 1 g of PVA was mixed with 20 ml of hot (70 °C) water with constant stirring for 2 h to form the clear solution. Afterwards, 10 ml of 0.3 g $VOSO_4$ added 1 M H_2SO_4 was added to the above solution with constant stirring and it was kept up to formation of glue like gel solution. The PVA/$VOSO_4$/H_2SO_4 gel electrolyte EDLC was fabricated by the method reported elsewhere. The prepared gel electrolyte was coated on the surface of the electrodes. Then, gel electrolyte EDLC was assembled together the gel electrolyte coated electrodes by face-to-face.

Figure S1

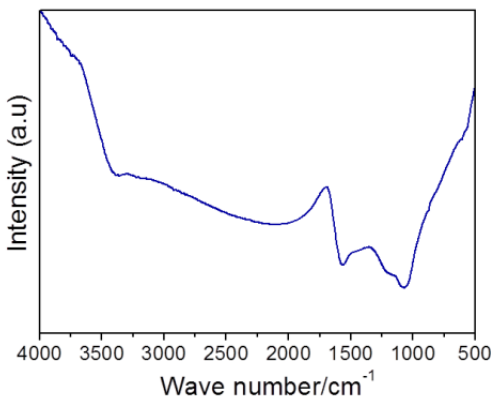

Figure 2. FT-IR spectra of NaA-3

Figure S2

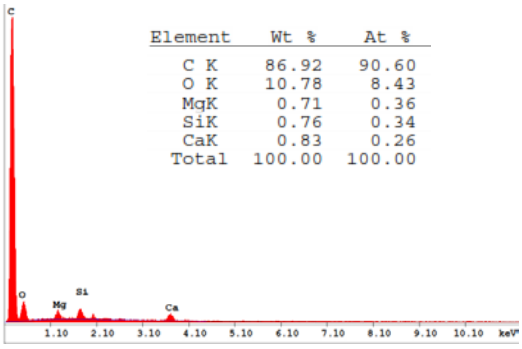

Figure 3. EDAX spectra of NaA-3

Figure S3

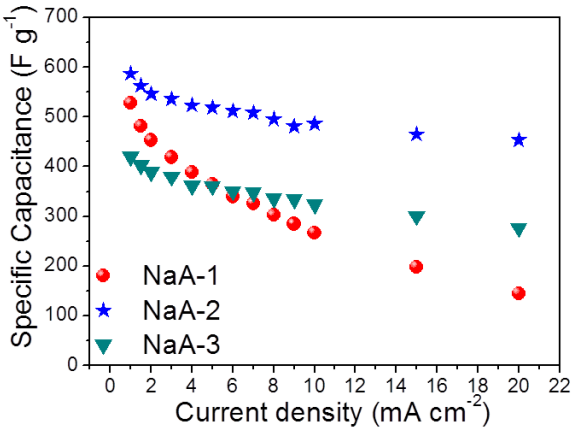

Figure S3. Specific capacitance as function of current density.

Figure S4

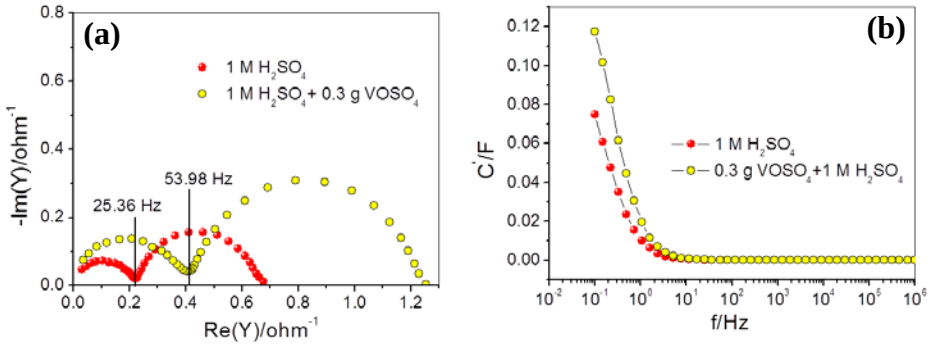

Figure 4. (a) Admittance polt; (b) Real capacitance as function of frequency.

Figure S5

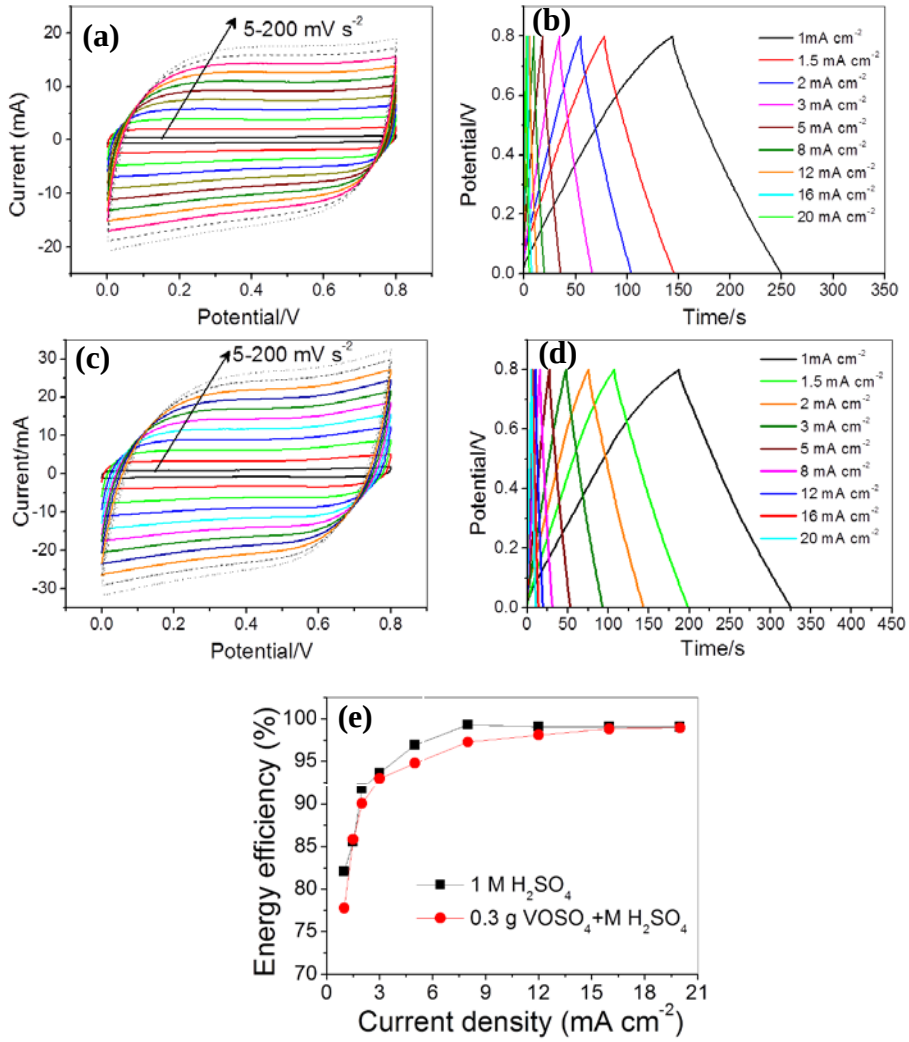

Figure 5. (a, b) CV at 5-200 mV s^{-1} and charge-discharge curve at 1-20 mA cm^{-2} of 1 M H_2SO_4 used EDLC; (c, d) CV at 5-200 mV s^{-1} and charge-discharge curve at 1-20 mA cm^{-2} of 0.3 g $VOSO_4$+1 M H_2SO_4 used EDLC; (e) Energy efficiency as a function of current density.

Figure S6

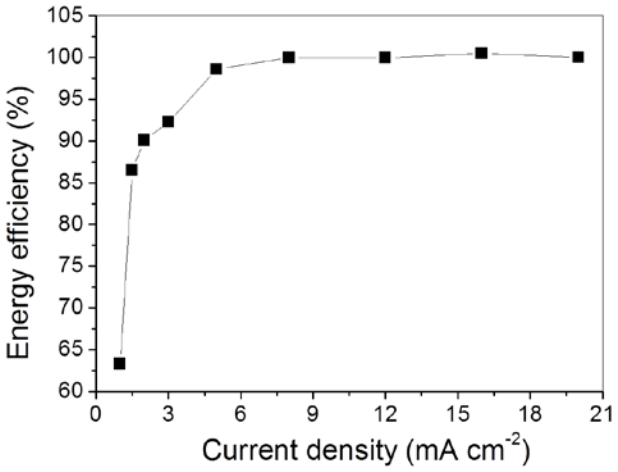

Figure 6. Energy efficiency Vs. current density of polymer gel electrolyte used EDLC

Figure S7

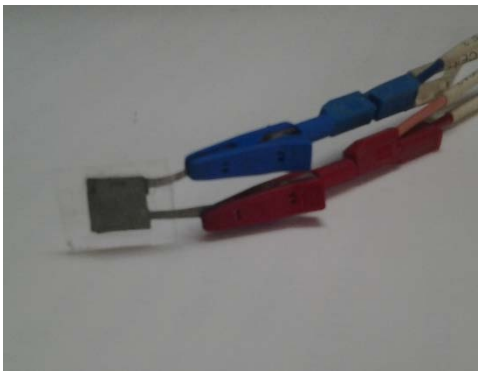

Figure 7. Fabricated EDLC using gel polymer electrolyte ($PVA/VOSO_4/H_2SO_4$) with on testing mode.