

# Advanced Energy Materials and Research

## Flexible reduced graphene oxide based papers: Fabrication and properties

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A novel way to synthesize flexible and conductive reduced graphene oxide (rGO) based papers is reported. Multi-walled carbon nanotubes (MWCNTs) are added into rGO to make rGO/MWCNTs nanocomposite papers. Their electrochemical performance is investigated in various electrolytes, such as KOH, LiOH, and NaOH. The supercapacitive behavior of the papers is examined via cyclic voltammetry, galvanostatic charging-discharging and electrochemical impedance spectroscopy. The physical properties are characterized by X-ray diffractometer, Raman spectrometer, surface area analyzer, thermogravimetric analysis and field emission scanning electron microscope. The rGO/MWCNTs paper synthesized with suitable amount of MWCNTs exhibits excellent performance in KOH with specific capacitance of 22.5 Wh/kg at 10 A/g, energy density of 115 Wh/kg at 0.25 A/g and power density of 115 W/kg at 0.25 A/g. Such high performance of the paper can be used for making future supercapacitors.

### Recent Publications

1. Hung C J, Lin P and Tseng T Y (2013) Electrophoretic fabrication and pseudocapacitive properties of graphene oxide/carbon nanotube nanocomposites. *Journal Power Sources* 243:594-602.
2. Nyholm L, Nyström G, Mihranyan A and Strømme M (2011) Toward flexible polymer and paper-based energy storage devices. *Advanced Materials* 23(33):3751-3769.
3. Gwon H, Kim H S, Lee K U, Seo D H, Park Y C, Lee Y S, Ahn B T and Kang K (2011) Flexible energy storage devices based on graphene paper. *Energy Environment Science* 4:1277-1283.
4. Rath T and Kundu P P (2015) Reduced graphene oxide paper based nanocomposite materials for flexible supercapacitors. *RSC Advance* 5:26666-26674.
5. Kumar N, Kumar A, Huang G M, Wu W W and Tseng T Y (2018) Facile synthesis of multi-walled carbon nanotube/graphene oxide nanocomposite