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Ultra-rechargeable flexible Graphene micro Supercapacitor power banks charged by solar power

Abstract

A Supercapacitor differs from the normal capacitor in two basic ways: the plates of a Supercapacitor have a larger surface area and the distance between them is much smaller, as compared to the conventional capacitors due to which it can be used for high power density applications. A Supercapacitor is similar to ordinary capacitor, however, it can store extremely large amounts of charge. Capacitors used in electronic circuits have capacitances in the ranges of 400 to 800 micro farads and those used in RF applications are as small as 1 Pico farad [1-2]. Although, the large amount of charge represents only a small fraction of the electrical energy that can be stored into a battery, its ability to charge and discharge instantaneously as compared to other lithium-ion and lithium polymer battery offers it a competitive edge. This is because a Supercapacitor develop charge by static polarization, while a conventional battery is energized slowly through chemical reactions [3].

The proposed fabrication methods enable the on-chip integration of microelectronic devices and therefore provide an opportunity for the development of a variety of micro/nano-sized energy devices. composite materials comprising a polyaniline nanofibers conducting polymer and a filler nanomaterial (Few Layered Graphene nano sheets) and methods of making the composite materials. This study also relates to the use of the composite materials for making prototype of flexible supercapacitors device. The invention further relates to compositions formed in the method and their use in various applications including in making the composite materials and the use of said compositions and composite materials in flexible electrodes which are used in micro supercapacitors based power banks charged with solar energy.

Herein we developed flexible electrodes which are showing specific capacitance around 650F/g and this device shows excellent cyclic stability up to 1000cycles.The electrodes are fabricated using Exfoliated graphite(EG) material and which are further processed by insitu-coating of Few Layered Graphene (FLG)-polyaniline composite material to enhance the specific capacitance of the electrode. The electrodes are assembled with suitable separator and electrolyte. In this proposed project we are working on prototype of the device (Dairy type supercapacitor power banks) and integration with solar panels. (Please see the figure)

References

[1] Gates, B. D. Flexible Electronics. Science 323, 2009, 1566.
[2] M. Beidaghi, Y. Gogotsi, Energy Environ. Sci. 7, 2014, 867.
[3] Yun, Y. Lim, G. N. Jang, D. Kim, S.-J. Lee, H. Park, S. Y. Hong, G. Lee, G. Zi, J. S. Ha, Nano Energy 19, 2016, 401.

Figures

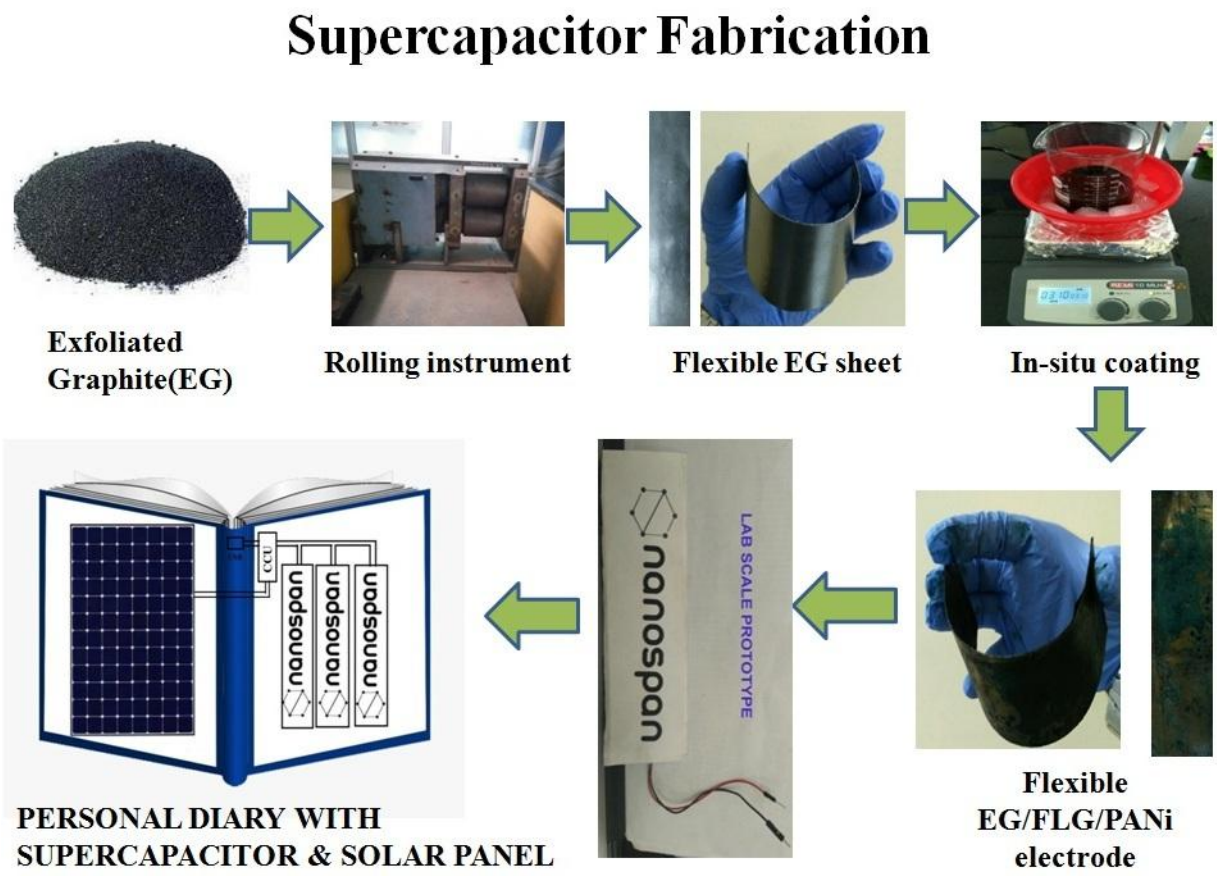

Figure 1: Process steps of making proposed Supercapacitors