Supercapacitors step-up voltage window using organic nanofibres

Scientists have developed energy storage devices with stepped-up voltage window using organic nanofibres, which can serve as miniaturized energy source for supplying small packets of energy to the various electronic gadgets that would be needed for the lifestyle of the future.

While tiny batteries could provide the desired supply of energy, they are incapable when it comes to energy requirements in the form of a power pulse, which capacitors could deliver only if their energy storage capacity is increased. Supercapacitors are poised to fill the gap in between providing desirable energy and power densities in one go. It is critical to enhance the operable voltage window of supercapacitors to step up their efficiency above present-day supercapacitors, which operate with voltages typically below 3 V.

In this direction, Prof G U Kulkarni and his group from Centre for Nano and Soft Matter Sciences, Bangalore, an autonomous institute under the Department of Science & Technology, Government of India, have come up with a simple method for the fabrication of a planar supercapacitor using organic nanofibres as solid-state electrolyte drop coated on low-cost titanium metal microelectrodes. The present work has been recently published in the scientific journal ‘Nano Energy’.

Mr Suman Kundu, the primary researcher who worked on the project, said “It is remarkable to know that the fabricated device offers an operating voltage of 8 V, which is unprecedented. The excellent synergy between the organic nanofibres and ambient-formed thin oxide layer on Ti provides stability at this high voltage.” He also said that the planar structure enables the device to be charged even at ultrafast scan rates, and the other relevant parameters such as ambient stability, cyclability, and capacity retention correspondingly fall in line making the device overall high performing. This is perhaps the first attempt of exploring fast ion movements in ordered conducting organic nanofibres for charge storage.


For more details, Prof. G. U. Kulkarni (guk@cens.res.in) can be contacted.