

Power to the paper

Hjalmar Granberg, project manager at Swedish research institute Innventia, has helped develop paper with the ability to store electricity. Consisting of nanocellulose and conductive polymer, his findings have “sparked” a great deal of interest.



Granberg presented his findings in the journal *Advanced Science*, together with researchers from KTH Royal Institute of Technology, Linköping University, the Technical University of Denmark and the University of Kentucky.

The demonstrated material is a rubber-like paper based on cellulose fibres that have been refined into nanocellulose at Innventia’s nanocellulose pilot facility. The nanocellulose is dispersed in water, and when an electrically conductive polymer is added the polymer forms a thin coating around the nanocellulose fibres.

The material has been used to manufacture a sheet fifteen centimetres in diameter and a few tenths of a millimetre thick that can store as much as 1 F, similar to the super capacitors currently on the market. The material can be recharged hundreds of times, and charging only takes a couple of seconds.

“The intention is to use ‘Power Papers’ to pave the way for renewable energy. They are an intermediate storage of energy for peak production (full sunshine for solar cells, running spring water for water energy) to times when there is peak demand for energy. Power Papers could also be used as super capacitors in charge stations for electric cars,” notes Granberg.

Explaining how the development began, Granberg shares, “We worked as a team and made use of each other’s expertise. One of the keys to the breakthrough was working with polymers in a wet state. This makes the cellulose flexible and adaptable, enabling us to build thick layers. We

also created sufficient mechanical properties to be able to handle the rubber-like paper.”

The project has already beaten four world records, namely the highest charge and capacitance in organic electronics: 1.2 Coulombs and 2 Farads respectively; the highest measured current in an organic conductor: 1 Ampere; the highest capacity to conduct both ions and electrons simultaneously; and the highest transconductance in a transistor (change in current depending on the voltage). We are the first to have measured values above 1 Siemens. The previous record was a few thousandths of a Siemens.

TAPPSA asked him about recyclability and the life cycle. “The material was prepared in the lab in search for electrical high performance. The recipe as well as adaptation to high speed production processes would now have to be altered with scalability and sustainability aspects in mind.” He adds that a large research project is starting right now to pinpoint these issues.

There is just less than a year of work left within the current Power Papers project, which is being financed by the Wallenberg foundations and RISE. In future, the Swedish Foundation for Strategic Research will finance the production of Power Papers, in which we will focus on production methods. There has been a great deal of interest since the press release was issued just about a week ago, and we have received enquiries from industrial players who are interested in implementing the technology. ■

See the TAPPSA events on page 2 for information on Innventia’s conference and workshop on Energy Storage Paper.

Tetra Pak expects to deliver over 100 million fully renewable packages in 2016

The world’s first package made entirely from plant-based materials has gained popularity among consumers across Finland, Sweden, Norway and the Netherlands, with numerous brands.

Bjørn Malm, Head of Corporate Responsibility at TINE, one of Tetra Pak’s latest customers to use the package says: “We believe growing our business sustainably is not just good for the environment, it also improves our competitiveness and provides product differentiation.”

TINE has committed to making all our milk cartons renewable from next year.”

“Every package is traceable to its origin,” says Penny Ntuli, communications director at Tetra Pak South Africa. “Traceability helps customers enhance their brand as it promotes food safety, and helps them communicate with consumers. This anniversary is a significant milestone in our ambition to provide 100% renewable packaging across our product portfolio.”

The package’s environmental profile was recognised with seven awards last year, including first place in the Sustainable Innovation category at the Ethical Corporation Responsible Business Awards. “The success of Tetra Rex Bio-based in its first year is extremely encouraging,” says Charles Brand, Executive VP Product Management & Commercial Operations at Tetra Pak. “We are proud to be the first company to deliver a package made entirely from plant-based materials.” ■