Sappi and Edinburgh Napier University innovation promises wonder material breakthrough

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- **Sappi to build a pilot-scale plant for low-cost Cellulose Nano Fibrils production**
- **Follows three-year partnership between researchers from global pulp and paper producer Sappi and Edinburgh Napier University**
- **Nanocellulose has potential to be used in a huge range of applications - from packaging and touch screen displays to car panels and wound care**
- **Market could reach 35 million tonnes per year by 2020s**
- **Continues Sappi's move into new and adjacent business fields based on renewable raw materials**

Scientists from Edinburgh Napier University and Sappi have developed a low-cost way to turn wood into a wonder material that could be used to build greener cars, thicken foods and even treat wounds.

It means Sappi will be able to produce the lightweight material on a commercially viable basis - and without producing large volumes of chemical waste water associated with existing techniques. The energy-saving process will be used in a new nanocellulose producing pilot plant to be erected by Sappi.

"Nanocellulose, extracted from wood fibres, has a number of unique optical, barrier and strength properties," said project coordinator Math Jennekens, R&D Director at Sappi Europe. "Unlike other lightweight, high-strength materials based on fossil fuels it is completely sustainable, making it very desirable as a new material for various industrial and transport applications."

The versatile material has previously been produced by intensively processing wood pulp to release ultra-small, or 'nano' cellulose fibers - each so small that 2,000 could fit inside the width of a single strand of human hair.

But the Edinburgh Napier research team say they have been able to drastically reduce the amount of energy needed to power the process, as well as the need for expensive chemicals.

"What is significant about our process is the use of unique chemistry which has allowed us to very easily break down the wood pulp fibers into nanocellulose," said Professor Rob English, who led the research with his Edinburgh Napier colleague, Dr Rhodri Williams.

"There is no expensive chemistry required and, most significantly, the chemicals used can be easily recycled and reused without generating large quantities of waste water.

"It produces a dry powder that can be readily redispersed in water and leaves the nanocellulose unmodified - effectively making its surface a chemical "blank canvas" and so more easily combined with other materials.

"The ability to bring all these attributes together have so far eluded materials scientists working in the field. It is very exciting."

Nanocellulose produced at the proposed Sappi plant could be used in a wide range of industrial and everyday products and devices because of the way they can improve the properties of materials they are combined with, said Professor English.

"It could be used to thicken water-based products such as paints, foods and concrete," he said. "Or when it's used in plastics to make a composite it can replace glass fibers, which is very attractive in the production of the next generation of lighter, fuel-efficient vehicles.

"Because of its low oxygen permeability it could also be a possible replacement for plastic films in packaging. Then there are also applications for it in containing films in lithium batteries and touch screen displays. And as cellulose is inherently bio-compatible and bio-absorbable, there is considerable potential in biomedical applications such as wound dressings and regenerative medicine."

Andrea Rossi, Group Head Technology, Sappi Limited, said a pilot production plant was being planned for "towards the end of 2015. This pilot plant" he continued " will move Sappi into new adjacent business fields based on renewable raw materials to produce innovative performance materials and help in delivering on Sappi's strategy to seek growth opportunities in adjacent and new markets."

Professor English added: "Commercial interest in nanocellulose is growing at a phenomenal rate following predictions of a possible 35 million tonnes per year market by the 2020s. And so the key challenge now is very much in business development and understanding the value offered by nanocellulose in our target markets."

According to Andrea Rossi, the pilot plant will test the manufacturing of dry re-dispersible Cellulose NanoFibrils (CNF). Using this proprietary break-through technology, Sappi will ultimately be able to manufacture CNF with unique morphology, specifically modified for either hydrophobic or hydrophilic applications. Products produced will be optimally suitable for conversion in lighter and stronger fibre-reinforced composites and plastics, in food and pharmaceutical applications, and in rheology modifiers as well as in barrier and other paper and coating applications.

Andrea Rossi indicated that using the products manufactured in the pilot-scale plant, Sappi will seek co-development with multiple partners to incorporate CNF into a large variety of product applications to optimise performance and to create unique characteristics.

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