



(LEFT) Björn Alriksson, Processum, standing with one of Processum's bioreactors in which bacterial nanocellulose will be produced. (RIGHT) This is an electron microscopic image of BNC from the bacterium *Komagataeibacter xylinus* (20 000× magnification).

## NANOCELLULOSE

# Bacterial nanocellulose can become a strength enhancer in board, textiles and bioplastics

In a joint research project, Sweden's Umeå University and Processum will develop methods for the production of bacterial nanocellulose (BNC) from residual streams from the pulp and paper industry. The aim is to produce sufficient quantities of bacterial nanocellulose to be tested as an additive in board, textile and bioplastic applications. Collaboration with companies from the paper and pulp industry as well as companies on the application side is welcome.

Different types of nanocellulose can give new and improved characteristics to a number of different materials. So far, research as well as most demonstration and production efforts have primarily been focused on cellulose nanofibres (CNF) and cellulose nanocrystals (CNC). In this project, researchers from Umeå will develop and scale up a method for the production of BNC. As the name suggests, nanocellulose is produced by bacteria.

"At Umeå University, our research group has already been able to produce bacterial nanocellulose in laboratory scale based on a residual stream from a pulp mill," says research leader Professor Leif Jönsson.

"We have produced small amounts of BNC that have been added to paper with promising results, including higher tensile and tear indices. Nanocellulose produced with the aid of bacteria differs from CNF and CNC. It is purer, has a higher degree of polymerisation, is more crystalline and thinner."

"The way we produce bacterial nanocellulose today is costly as methods are inefficient and the growth medium expensive," says Björn Alriksson, head of group biotechnology at Processum. "This is why we will use low-value residual streams from pulp mills as substrate and the production will be carried out in stirred bioreactors to try to improve the production. In this project, we will scale up the process starting in our laboratory scale multibioreactors, then continue with experiments in our 50-litre bioreactor and finally produce BNC in a 600-litre reactor."

The BNC will then be tested in applications such as strength enhancer in board, textiles and plastics. The goal is to produce BNC from industrial residual streams for applications where relatively high volumes of BNC are needed.

"Nanocellulose research has for years been a strong area at the Research Institutes of Sweden (RISE). The cooperation between Processum and Umeå University really complements the research activities conducted on MFC/NFC and CNC," says Pernilla Walkenström, acting division manager at RISE Bioeconomy.

"BNC is a very interesting product which can give improved characteristics to existing materials and be used for the production of entirely new bio-based materials," say Jönsson and Björn Alriksson, Processum biotechnology manager. "At the end of the project we will hopefully have enough BNC for realistic application tests. This means that we are open to national as well as international cooperation in different fields for the joint development of interesting applications." ■