

Characterisation

Newsletter

Number 08, August 2010

News from PFI

New Post doc position available:

PFI AS and NTNU are strengthening the competence within filtration and filtration technology. The recently started research project "[Nanofibril filters for environmental nanoparticles](#)" has an open Post doc position for the period 2011-2012. For further information contact: dr. ing. [Kristin Syverud](#) (PFI) or Prof. [Øyvind Gregersen](#) (NTNU).

New Post doc

Swarnima Agnihotri has completed her PhD on Biobleaching from the Indian Institute of Technology Roorke, India. Swarnima has joined PFI's [LignoRef](#) project and will be working on pretreatment of lignocellulosic raw materials for biofuel production.

Packaging

Cellulose-based [packaging](#) represents a sustainable alternative to the existing rigid packaging solutions, based on e.g. expanded polystyrene. During the last years, PFI has thus been working extensively in the development of [novel fibre-based water barrier packaging for transport of fresh fish and agricultural products](#). These activities have been part of an R&D project coordinated by [PFI](#) and financed by Norwegian industry and [The Research Council of Norway](#). The main objective of the project was to develop cellulose fibre-based packaging, suited for transport of fresh fish and agricultural products. The project has been multidisciplinary, including material development, coating trials, box design and transportation tests with fresh fish and vegetables. By the end of the project period packaging prototypes were developed both for fresh fish (whole and fillet) and vegetables.

An important part of the design and development of packaging solutions is the understanding of their structural properties. In this respect, [scanning electron microscopy \(SEM\)](#) offers an unique opportunity to explore and quantify structural details, as shown in this issue.

Upcoming events

TAPPI International Conference on Nanotechnology. Espoo, September 27-29. [Read more...](#)

ImageJ conference – Luxembourg 27-29, 2010. [Read more...](#)

Biofuel research seminar.

Trondheim. November 3-4, 2010.

[Read more...](#)

PFI Cellulose nanotechnology

research seminar. Trondheim, November 16-17, 2010. [Read more...](#)

Recommended links

PFI:

www.pfi.no

INNVENTIA:

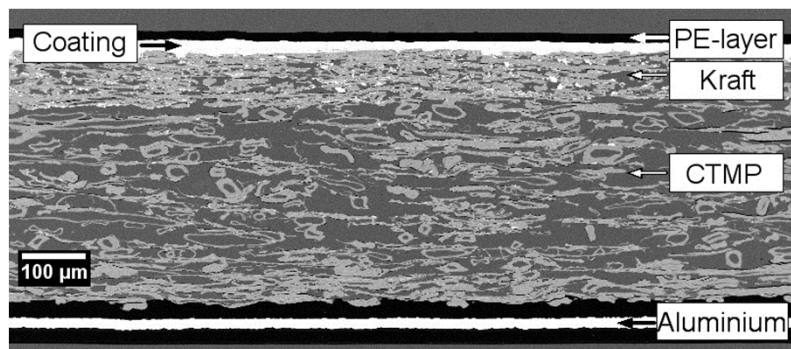
<http://www.innventia.com>

Next issue,
January 2011

- Preparation methods for microscopy

Selected analysis method

SEM, backscatter electron imaging of liquid board



A SEM high-resolution analysis of liquid board can yield the following information:

- Cross-sectional thickness
- Roughness
- Porosity and porosity distribution in the z-direction
- Component distribution in the z-direction
- Homogeneity of coating layers

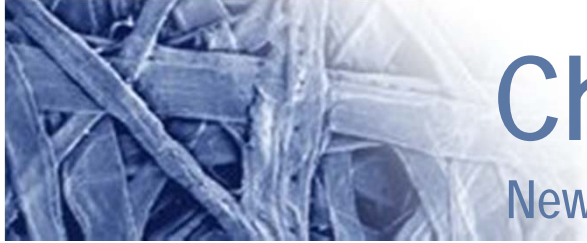
Editor

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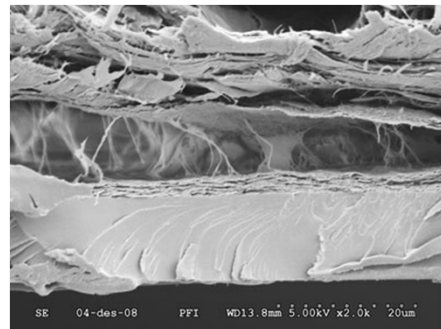
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High barrier packaging

Efficient approach to high barrier packaging using microfibrillar cellulose and shellac

Abstract

This paper presents an investigation on the enhancement of the barrier properties of paperboard and paper. Microfibrillar cellulose (MFC) and shellac were deposited on the fibre based substrates using a bar coater or a spray coating technique. The air, oxygen and water vapour permeability properties were measured to quantify the barrier effect of the applied coatings. In addition, the mechanical properties were determined and image analysis of the structure was performed to examine the coating adhesion. The air permeance of the paperboard and papers was substantially decreased with a multilayer coating of MFC and shellac. Furthermore, for the MFC and shellac coated papers, the oxygen transmission rate decreased several logarithmic units and the water vapour transmission rate reached values considered as high barrier in food packaging ($6.5 \text{ g/m}^2 \text{ 24 h}$).



The analysis of mechanical and morphological properties indicated good adhesion between the coating and the base substrate.

The figure shows a freeze-fracture surface SEM micrograph of sample AMS. at 2000x magnification and accelerating voltage of 5 kV. S indicates the Shellac coating, M the MFC layer and P indicates the base paper structure.

Reference: Hult, E.-L., Iotti, M. and Lenes, M. Cellulose 17: 575-586 (2010).

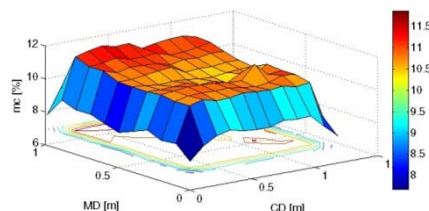
Reproduced from Hult et al. (2010).

Solid fiberboards

Moisture content of polyethylene coated solid fiberboard after industrial lamination

Abstract

Solid fiberboard is used mainly in highly demanding packaging applications. One solid fiberboard quality having six paper and paperboard layers, a thickness of 1.7 mm, and polyethylene coating was studied. Several material tests on liquid water and water vapor penetration were done to assess the environmental moisture sources that change the material moisture content after the lamination process. The in-plane diffusion coefficient of the combined board was determined based on an integrated unsteady state moisture transport equation and moisture sorption measurements. The transverse diffusion coefficient of the polyethylene coated kraft paper and the solid fiberboard medium were based on WVTR measurements. The original moisture content of the solid fiberboard sheet was measured gravimetrically two days after the lamination at the mill.



Reference: Paunonen, S., Lenes, M. and Gregersen, Ø. Accepted for publication in Packaging Technology and Science (2010).

The figure shows the moisture content of a solid fiberboard sheet two days after the lamination. Reproduced from Paunonen et al. (2010).

The results show that high relative humidity conditions during the transportation ($4 \text{ }^\circ\text{C}/90\% \text{ RH}$) change the moisture content of the transportation box made from a solid fiberboard sheet very little in eight days. Local moisture (or drier) areas are created near the sheet edges due to in-plane moisture transport through open material edges. The inplane diffusivity for the solid fiberboard grade in question was $5.87 \cdot 10^{-10} \text{ m}^2/\text{s}$.

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