Characterisation Newsletter

Number 07, January 2010

News from PFI

New Projects:

Nanofilter: Nanofibril filters for environmental nanoparticles:
Development of innovative protection against Nano-pollution. The project period is 2010-2012. *Read more…*

Bio-oil: The Bio-oil Refinery project aims at developing technology for producing and fractionating bio-oil components as a basis for a biorefinery producing green chemicals, transportation fuels and energy. The project period is 2010-2011. *Read more...*

New research scientist

PhD Marco Iotti will join PFIs research team from June 1st 2010. Marco Iotti has a PhD from the University of Modena, Italy and is presently post doc fellow within the PFI project "SustainBarrier".

Fibre-reinforced composites

Natural fibres, such as wood cellulose fibres, are gaining increased interest as reinforcement in composites. Wood fibres are recyclable and biodegradable and thus environmentally friendly. Fibres and their nanocomponents such as cellulose nanofibrils offer thus new perspectives in the development of advanced materials.

Proper utilization of wood fibres requires an extensive understanding of their properties, their interactions with the composite matrix and the corresponding structure-property relationships. Fibre orientation is an important structural property that may affect the strength properties of a given material. Such a structural characteristic can be assessed with modern 3D X-ray microtomography techniques. In addition, the fibre-matrix interactions can be quantified at the micro- and nano-levels, applying conventional or field emission scanning electron microscopy. The mentioned techniques are complementary and advance our comprehension of relevant structure-property relationships, which is academically and industrially valuable.

Upcoming events

American Chemical Society – National Meeting and Exposition, San Francisco, California, March 21-25 2010. *Read more…*

TAPPI PaperCon 2010 – Atlanta, May 2-5 2010. *Read more…*

Austrian Paper Conference, Graz, May 19-20 2010. *Read more…*

Recommended links

PFI:
www.pfi.no
INNVENTIA:
http://www.innventia.com

Next issue, August 2010

- Packaging

Selected analysis method

Structural characterisation of fibre-reinforced composites

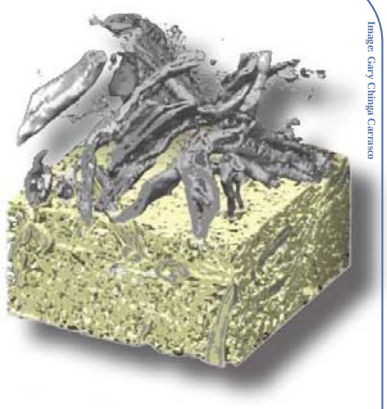
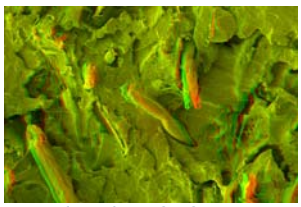


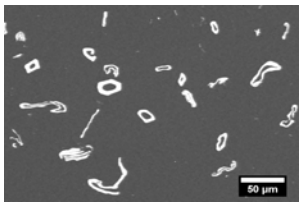
Image: Gary Chinga Carrasco

Quantification of fibre distributions, fibre orientations

X-ray microtomography



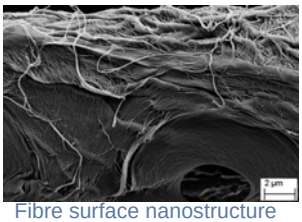
Stereo imaging of a fracture area



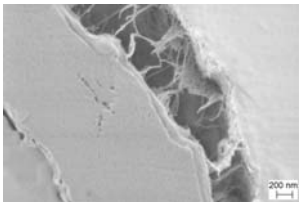
Images: Gary Chinga Carrasco, Per Olav Johnsen

Fibre cross-sectional dimensions, spatial distributions

Conventional scanning electron microscopy



Fibre surface nanostructure



Images: Gary Chinga Carrasco

Fibre-matrix interactions

Field-emission scanning electron microscopy

Editor

Contact: Dr. ing. Gary Chinga Carrasco
Postal address: PFI, N-7491 Trondheim, Norway
Email: gary.chinga.carrasco@pfi.no
Phone: +47 73550925
Fax: +47 73550999

Papir- og fiberinstituttet AS
Paper and Fibre Research Institute
PFI

Characterisation Newsletter

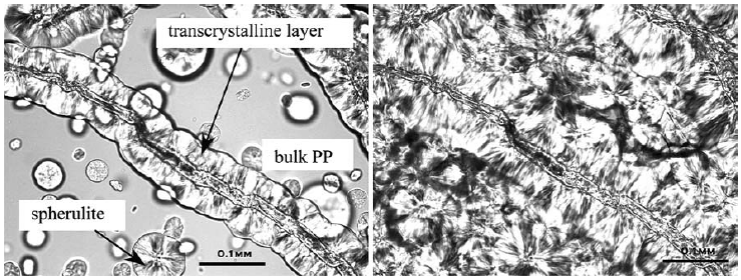
Number 07, January 2010

Fibre-polypropylene composites

Effect of surface chemistry and topography of sulphite fibres on the transcrystallinity of polypropylene

Abstract

In the present study the effect of chemically and mechanically treated cellulose materials on the degree of polypropylene transcrystallisation was investigated. The cellulose materials which were sulphite fibres, microcrystalline cellulose (MCC) and knife milled sulphite fibre, were either chemically treated by esterification or mechanically treated by beating. The esterified cellulose materials did not induce a transcrystalline layer, however, all unesterified cellulose materials clearly induced a transcrystalline layer. The fibres which were mechanically treated by beating gave a higher degree of transcrystallisation than the untreated ones. Our results show the importance of the surface chemistry of the added fibres on the growth of transcrystallisation in polypropylene composite materials.



Reproduced from Lenes et al. (2006).

The figure shows light microscopy images of PP mixed with sulphite fibres. The crystallisation was first initiated by the fibres leading to a transcrystalline layer around the fibre (left image). Gradually the spherulites in the bulk polypropylene started to grow. The crystallisation after completion is shown on the right image.

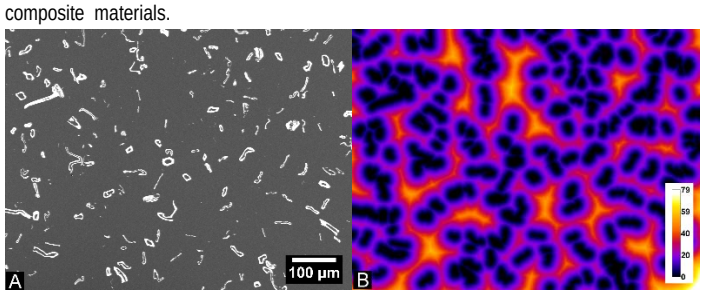
Reference: Lenes, M., Gregersen, Ø. W. Cellulose 13 (4): 345 - 355 (2006).

Spatial distribution of fibres

Computer-assisted scanning electron microscopy of wood pulp fibres: dimensions and spatial distribution in a polypropylene composite

Abstract

A shape description approach is introduced as a step for performing an automatic processing of fibre cross-sectional images. The approach, in combination with appropriate mathematical morphology, yields automatically edited images, which are suitable for further computerized image analysis. Important parameters such as fibre wall thickness, fibre perimeter, form factor and collapse index are quantified effectively and objectively. Although some differences are encountered within groups of split fibres, manual and automatic quantification of intact fibres yields similar results. In addition, the suitability of a distance transform approach for quantifying the fibre inter-distances in composites is demonstrated. Such tools will be valuable for understanding the mechanical properties of engineered fibre-reinforced composite materials.



The figure shows a distance transform analysis. A) Original SEM image of a fibre-reinforced PP-composite. B) The corresponding distance transform for quantification of fibre spatial distribution. Reproduced from Chinga-Carrasco et al. (2009).

Reference: Chinga-Carrasco, G., Lenes, M., Johnsen, P.O. and Hult, E.-L. Micron, 40 (7): 761-768 (2009).

Contact Address

Postal address: PFI, N-7491 Trondheim, Norway
Telephone/fax: +47 73 55 09 00/ +47 73 55 09 99
e-mail: firmapost@pfi.no
Internet: www.pfi.no

Papir- og fiberinstituttet AS
Paper and Fibre Research Institute
PFI