Bio-based Fibre Materials at BOKU

Institute of Wood Technology and Renewable Materials

Wood Technology/Bio-based Fibres

Division Chemistry of Renewables
Prof. Rosenau
Prof. Potthast

University Research Center Tulln (UFT)

~100 people at BOKU campus Tulln work on chemistry of- and materials from renewables

Kompetenzzentrum Holz
DI Hultsch
Dr. Hansmann

Institute of Natural Materials Technology
Dr. Mundigler
Prof. Wimmer

University of Natural Resources and Life Sciences, Vienna
Department of Material Sciences and Process Engineering
Bio-based Fibre Materials Group

1 Professor
2 Post-Docs
8 PhD students
1 Technician
2 Student assistants
What can we offer?

➢ Disintegration and pretreatment

- Cutting mill
- Disc Refiner
- Masuko Grinder
- HP-homogenizer
What can we offer?

- Modification, drying and dispersion

- Pressure reactor
- Spray Dryer
- Freeze Dryer
- Ultrasonicator
What can we offer?

- **Paper/composite preparation & testing**

- Valley Beater
- Paper Handsheets
- Cast Composite Film
- Sheet Former
- Mechanical Testing
What can we offer?

- Thermoanalytics and wetting properties

- TGA/DMA/DSC
- Tensiometer
- Drop Shape Analyzer
Foams from lignocellulosics

- Preparation of a foam material from a lignocellulosic feedstock for thermal-/acoustic insulation, lightweight panels, etc.

- Foaming:
  - Aqueous MFC/MFLC suspension
  - Addition of furfuryl alcohol + catalyst
  - Freeze drying
Foams from lignocellulosics

Furfuryl alcohol (FA)-based MFC/MFLC foams

Optical appearance of freeze-dried MFC and MFLC with increasing content of furfuryl alcohol

SEM images of freeze-dried MFC (a, c) and MFLC (b, d) with furfuryl alcohol
Foams from lignocellulosics

Mechanical Properties of FA-based foams

Representative stress-strain curves for MFC, FA-reinforced MFC and unreinforced MFLC (a) as well as FA-reinforced MFLC (b)

Comparison of mechanical properties of freeze-dried MFC foams from literature with results obtained in the present study
Improved Oil Surfaces for Wood

- Trend towards the use of oil in wood surface finishing - “Green”
- Limitation: Low resistance to mechanical exposure (scratching, abrasion) and chemicals
- Aim: Improving the resistance of oiled wood surfaces without affecting their pleasant optics/haptics
Improved Oil Surfaces for Wood

- Cellulose nanofibrils-(CNF)-modified oil coatings

- CNF were chemically modified by acetylation or adsorption of alkyl ketene dimer (AKD)
- Modified CNF were added to oil (1 wt.%)
- Oil applied to wood + characterisation

Micrographs of wood finished with unmodified (left) and CNF-modified oil (right)
Improved Oil Surfaces for Wood

➢ Wear resistance of CNF-modified oil coatings

Wear resistance of oiled wood surfaces determined by contact angle measurement after exposure to abrasive wear in an abrasion tester.

Water contact angle [°]

Number of cycles

0 25 50 75 100 125 150 175 200 225 250

- 2x Oil
- 1x Oil / 1x CNF-Oil
- 1x Oil / 1x acCNF-Oil
- 1x Oil / 1x AKD-CNF-Oil
- 2x AKD-CNF-Oil
Thank you for your attention!