UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot • your knowledge partner

Wood properties + composites
Analytical wood science

Main focus areas

- Properties of burnt wood
- Wood plastic composites
- Effect of climate change on wood quality
- Cellulose nanowhiskers

Properties of burnt wood

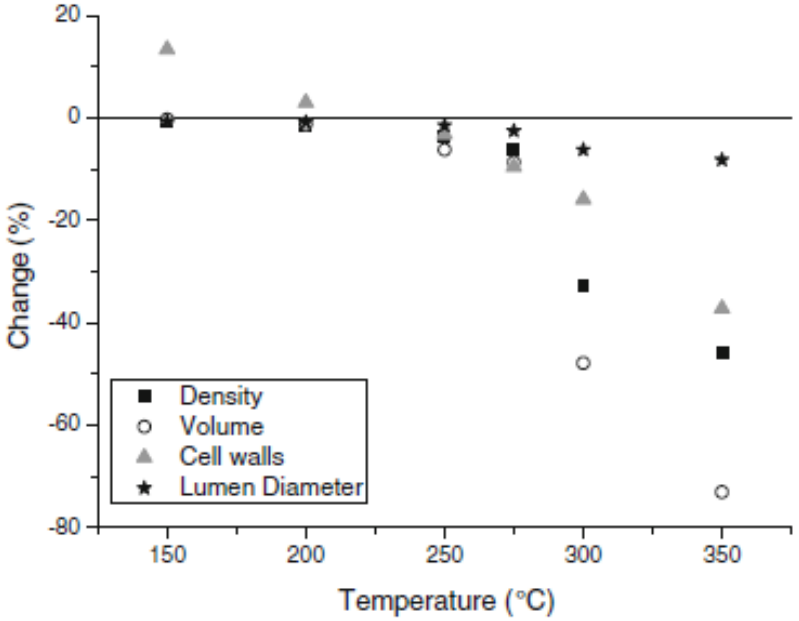
- Classification of timber from *Pinus radiata* trees exposed to forest fires
  S. Rust, MSc, graduated 2015

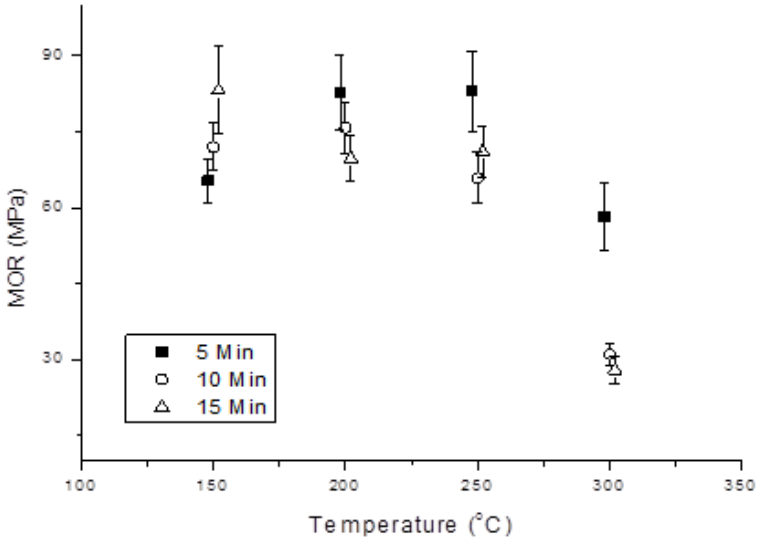
- The effect of fire damage on the growth and survival mechanisms of selected native and commercial trees in South Africa
  B. Odhiambo, PhD, 2015

- Thermal conductivity of *E. dunnii* and *E. macarthurii*
  L. Mngomezulu, PGD, 2016

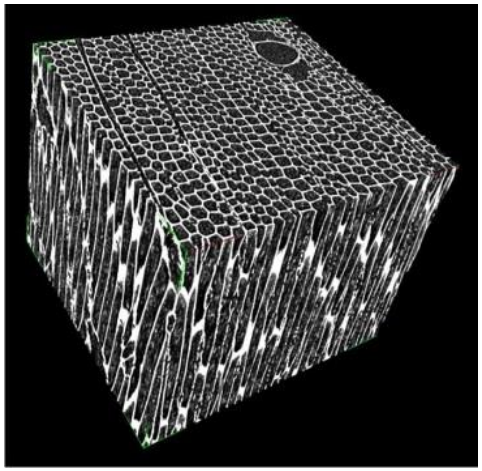
- Determination of the "cut-off" temperature of *E. dunnii* and *E. macarthurii*
  T van Groeningen, D. Mark, BSc final year projects, 2016

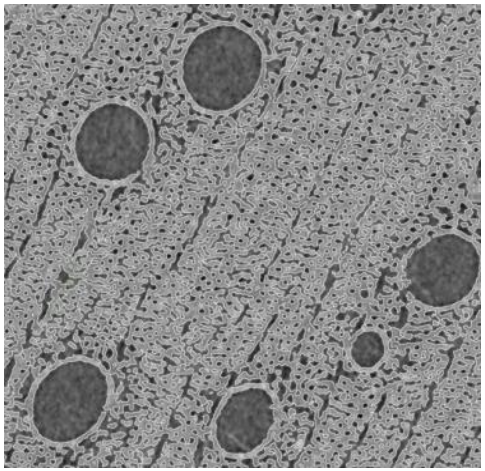
Properties of burnt wood

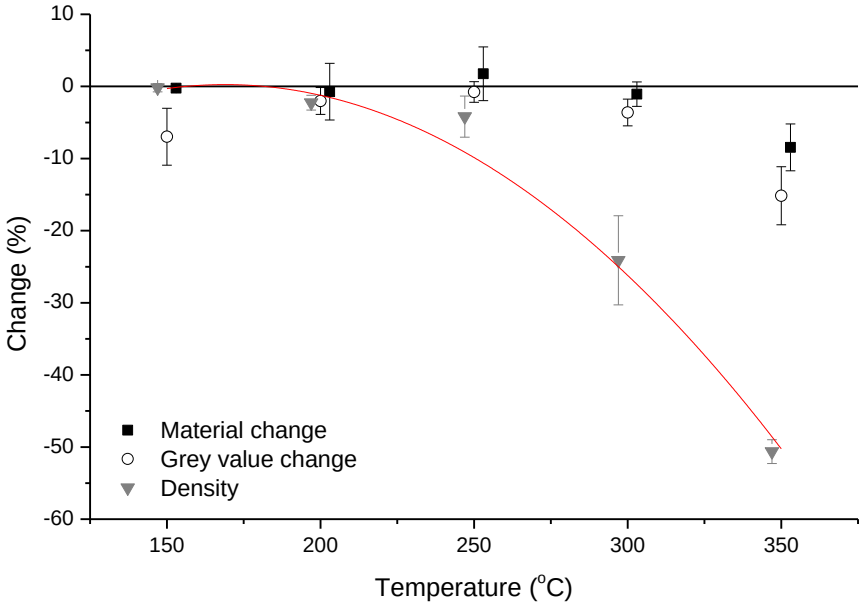




Analysis of degradation temperatures with CT

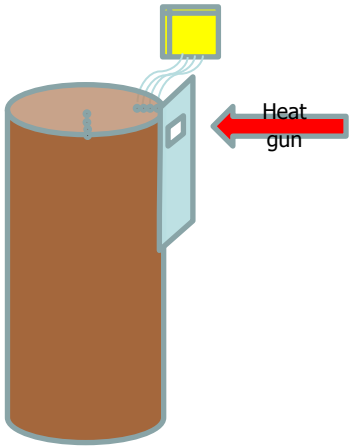


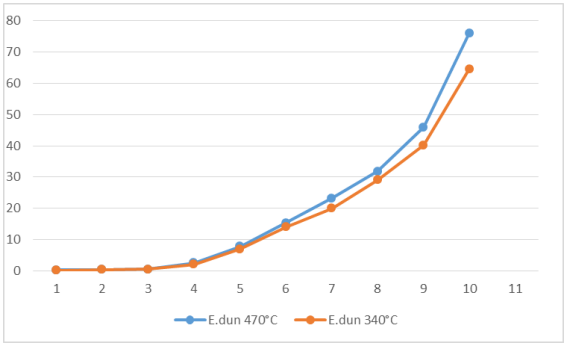


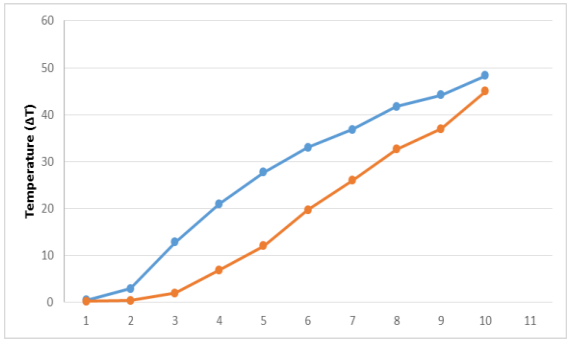


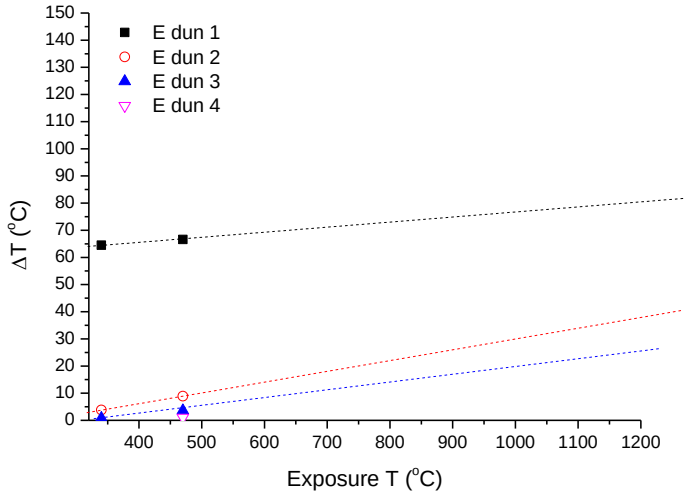
Property	E. mac	E. dun	Pine
Density	186	207	NA
Grey value	250	254	215
Material	280	NA	220
CWT	235	220	234
Vessel diameter	275	250	-
Lumen diameter	236	254	214

Thermal conductivity









Properties of burnt wood

Way forward:

- Determine change in chemical composition with increasing exposure temperature (MSc)

- Determine exposure temperature after occasion (PhD)

Wood Plastic Composites

- The effect of wood composition and compatibilisers on WPCs
  A Shebani, PhD, 2010

- The effect of molecular composition on the properties of polyolefin-wood composites
  NC Basson, PhD, 2013

- Intermolecular adhesive forces in WPCs analysed with Atomic Force Microscopy
  B Effah, PhD, 2016

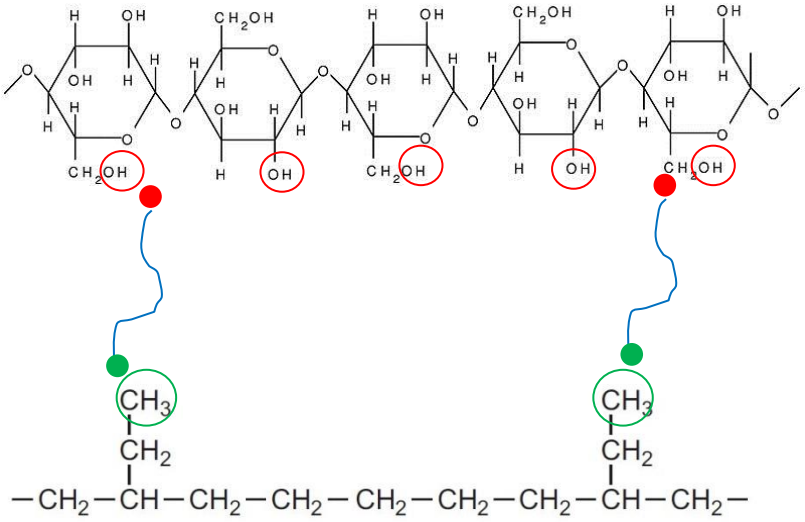
Cooperation with Prof. A van Reenen

Polymer Science, SU

WPCs

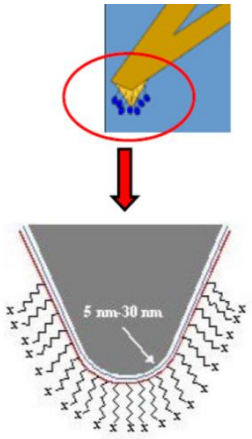
- Focus on wood from invasive species ⇨value added products
- Focus on novel/cheap compatibiliser

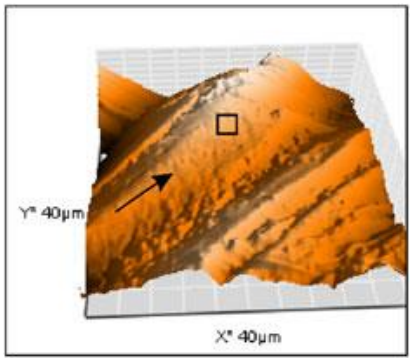
cellulose

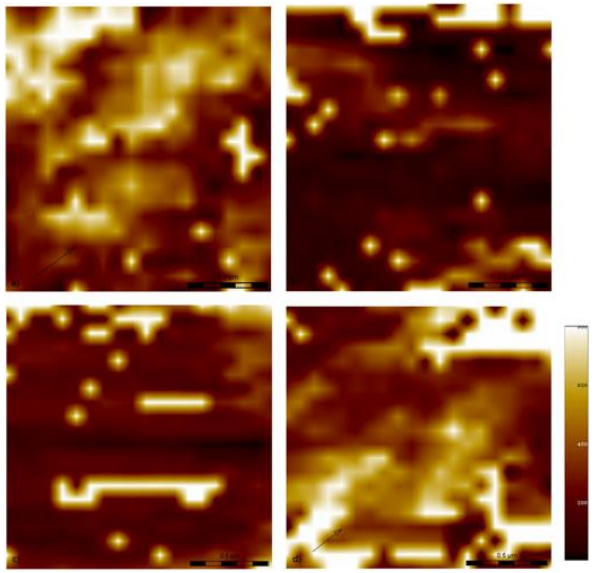


LLDPE

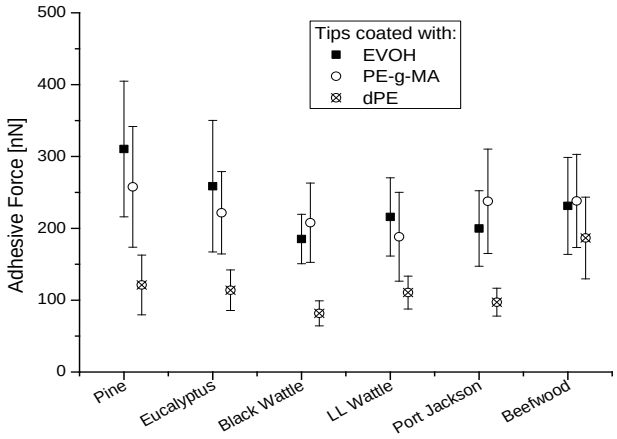
WPCs

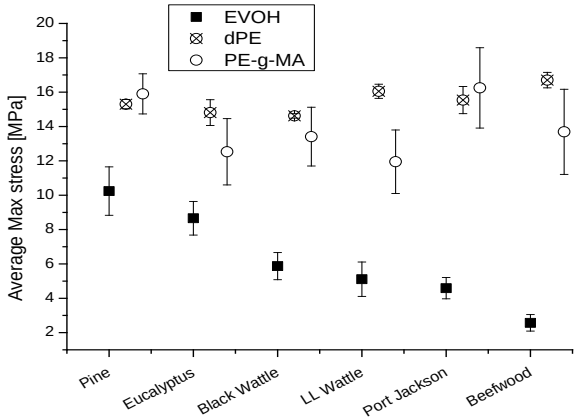






Adhesive force map of the EVOH coated tip on a) pine and b) beefwood and the PE-g-MA coated tip on c) pine and d) beefwood





WPCs

Way forward:

Large project in co-operation with Germany / Ethiopia granted (DLR)

Development of building material for low cost housing, upscaling of products, development of low-cost processing equipment

Effect of climate change on wood quality

your knowledge partner

The effect of site and cambial age on selected anatomical properties of mid-rotation *Pinus radiata.*

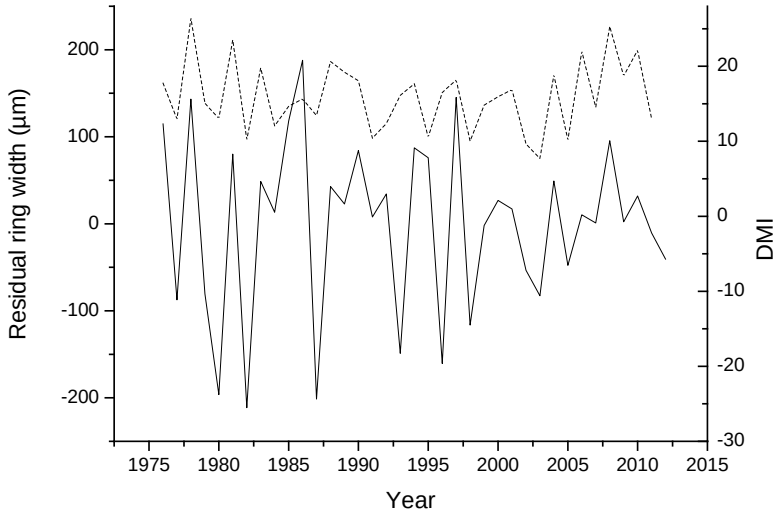
D Wondifraw, MSc, 2012

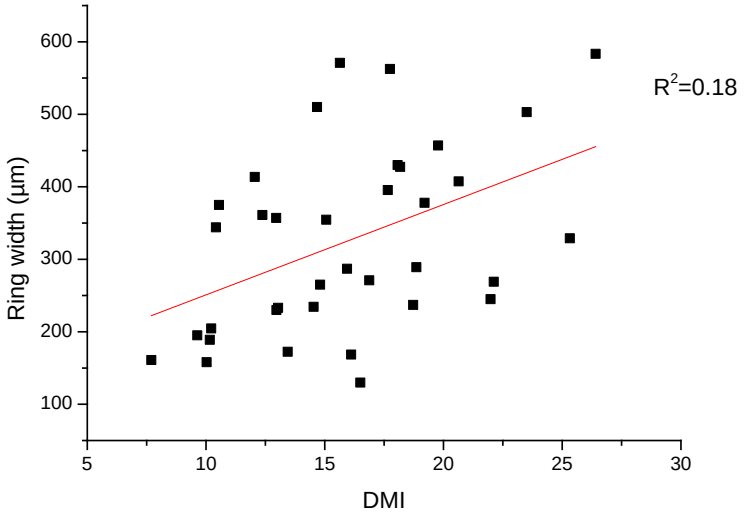
Response of selected Zambian hardwood species to changing climatic conditions

F Munalula, PhD

Cooperation with Dr. Thomas Seifert

Effect of climate change on wood quality





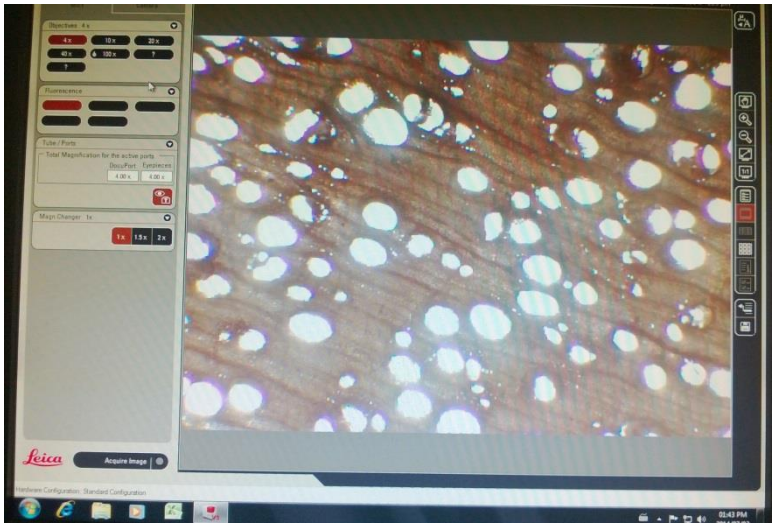
Site	Species	R^2 (Adj)	Mean sensitivity
Livingstone	*B. spiciformis*	0.18	0.59
Lusaka	*B. spiciformis*	0.25	0.47
Choma	*B. spiciformis*	0.20	0.44
Kitwe	*B. spiciformis*	0.18	0.37
Mwinilunga	*B. spiciformis*	0.18	0.36

Effect of climate change on wood quality

your knowledge partner

Way forward:

- Ring width-density correlation
- Anatomical properties



Cellulose nanowhiskers

your knowledge partner

Characterization and application of nano - cellulose isolated from South African invasive wood species

K. Raatz, MSc

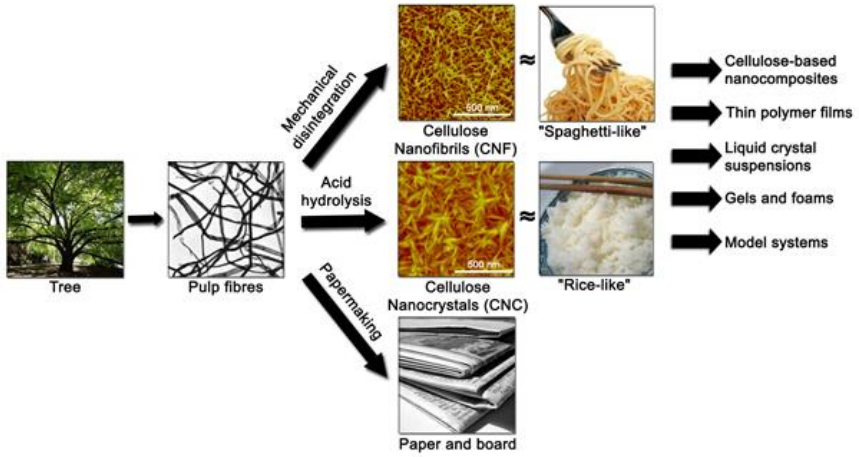
Cooperation with Dr Marietjie Lutz

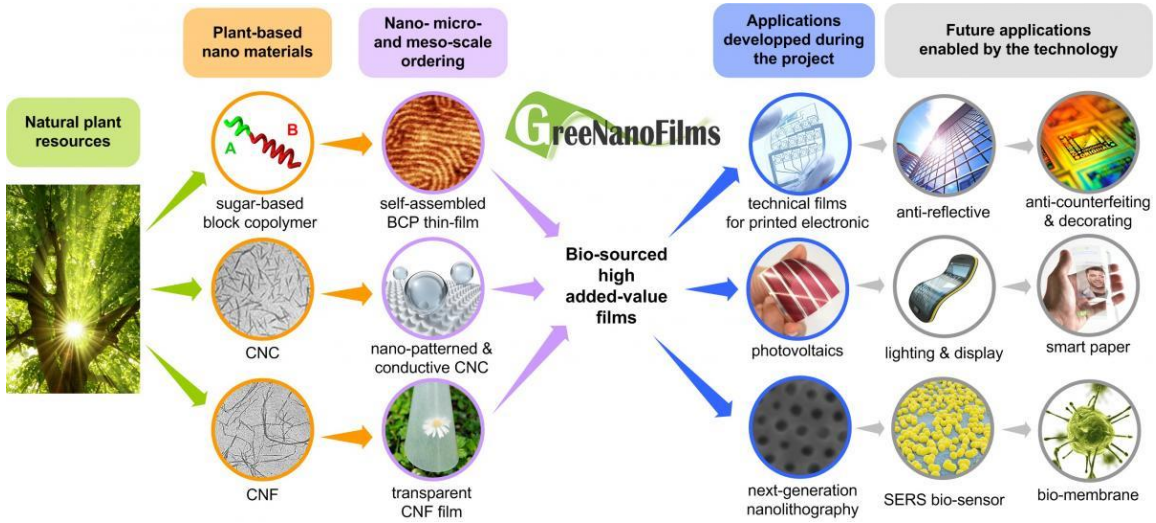
Polymer Science, SU

Cellulose nanowhiskers

Potential uses as:

- Reinforcement materials
- Carriers (medical, food etc.)
- Thickener, absorbents
- Medical and environmental filter membranes
- Electronic devices (displays)

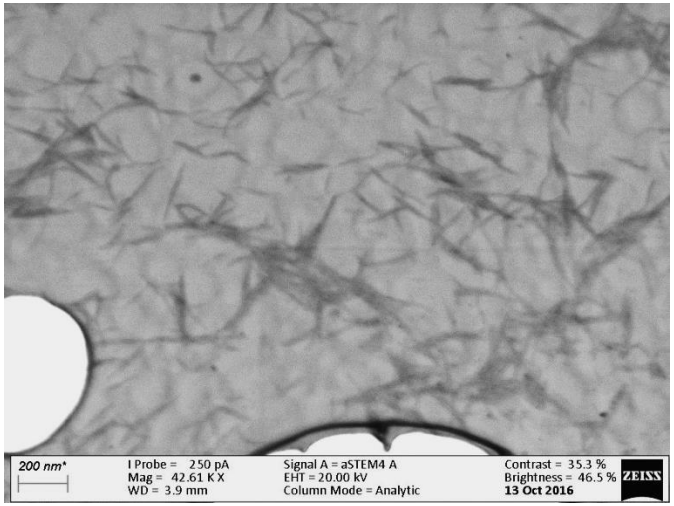




Cellulose nanowhiksers

- Synthesis from (invasive) hardwoods: *E. gomphocephala* and *A. cyclops*
- Comparison to CNCs made from commercial α - cellulose

Around 200 nm



Special projects

- Potential of non-woody AIPs for energy generation
  M Melane, MSc 2016

- Biomass characterisation for energy conversion
  Ongoing service to various stakeholders

- Investigation into the premature failure of treated poles.
  SAWPA funded project

- Ageing and degradation studies