sherpack

From barrier materials to biosourced packaging

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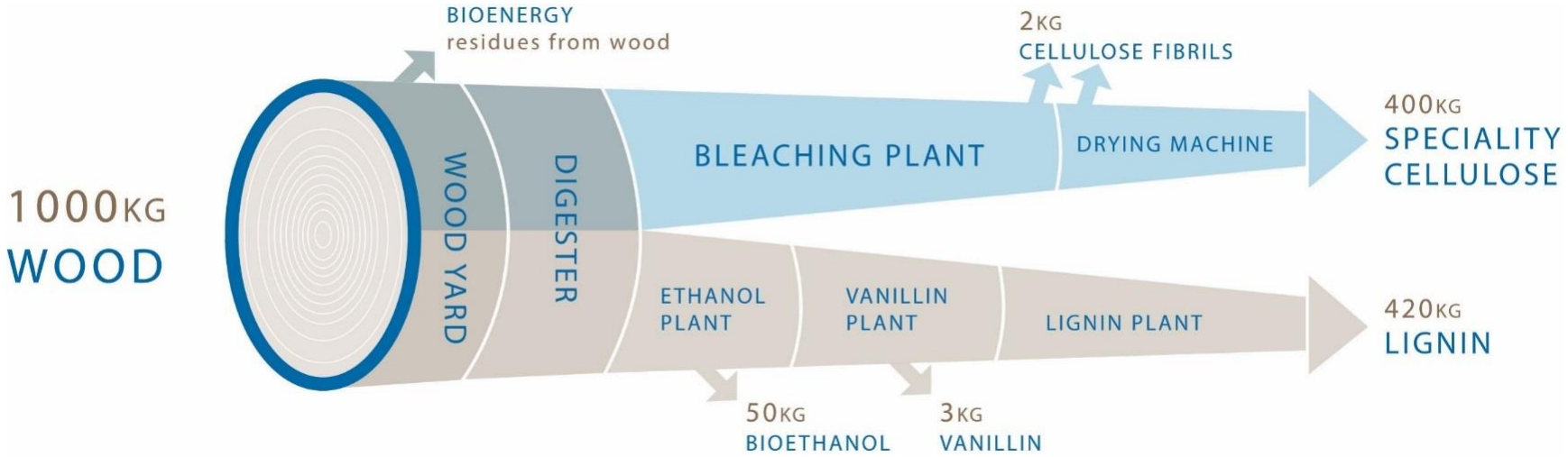
Bio-based Industries Consortium

Horizon 2020
European Union Funding
for Research & Innovation

BIO-BASED INDUSTRIES
Public-Private Partnership

Borregaard – world's most advanced biorefiny



SPECIALTY CELLULOSE
Construction materials
Filters
Inks and coatings
Casings
Food/Pharma/Personal care
Textiles

LIGNIN
Concrete additives
Animal feed
Agrochemicals
Batteries
Briquetting
Soil conditioning

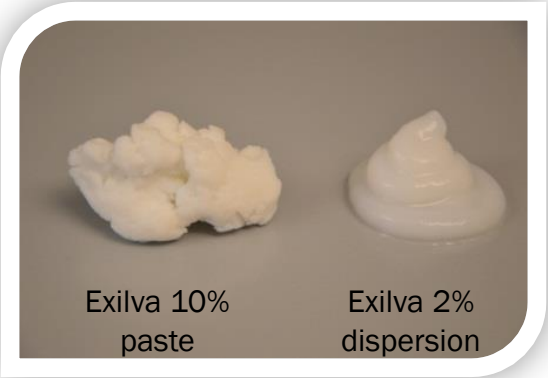
VANILLIN
Food
Perfumes
Pharmaceuticals

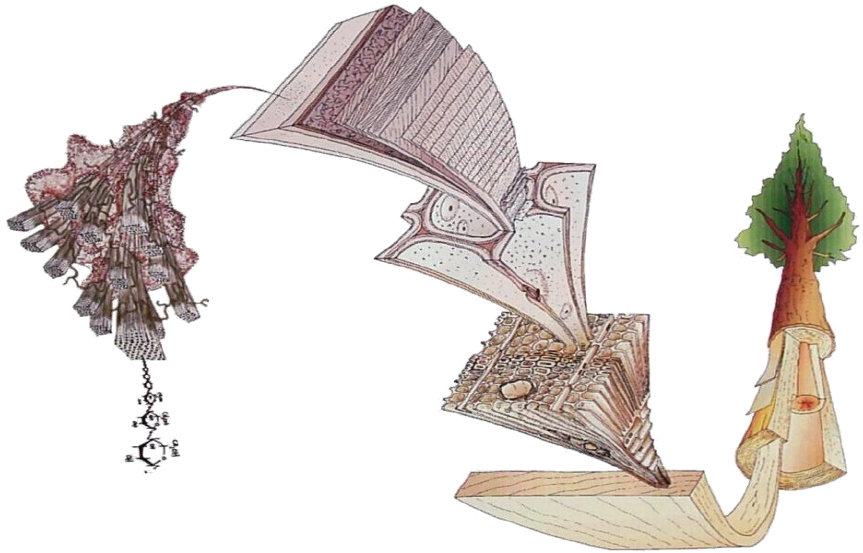
BIOETHANOL
Pharmaceutical industry
Biofuel
Paint/varnish
Car care

CELLULOSE FIBRILS
Adhesives
Coatings
Agricultural chemicals
Personal care
Home care
Construction

Exilva - A new product from Borregaard

- Microfibrillated Cellulose (MFC)
- High available surface area with functional OH groups – new, exciting properties

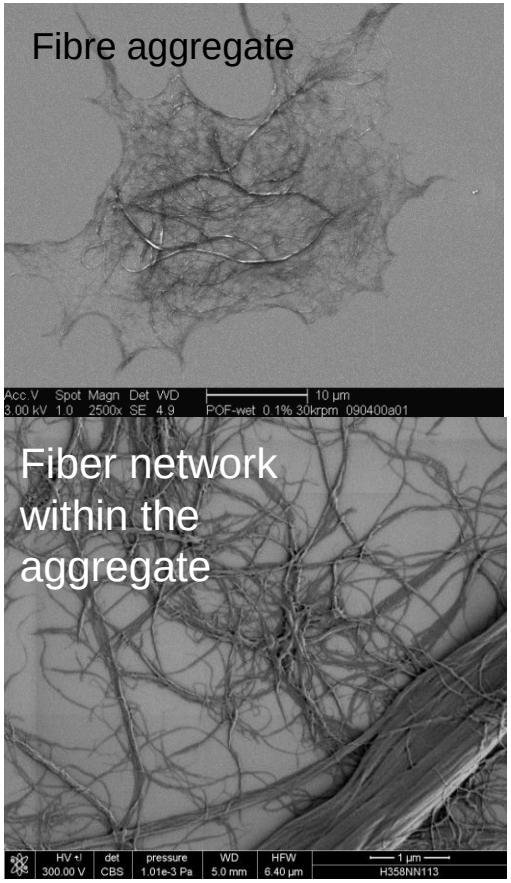




Source: Harrington (1996)
Univ. Of Canterbury

Exilva - Properties

- 3D network of flexible microfibril aggregates
- Interesting rheological properties
  - Highly shear thinning
  - High viscosity at rest
  - Fast viscosity recovery
- Very high water holding capacity
- Good film forming and barrier properties
- Non-toxic, environmentally friendly and a 100% bio-based product



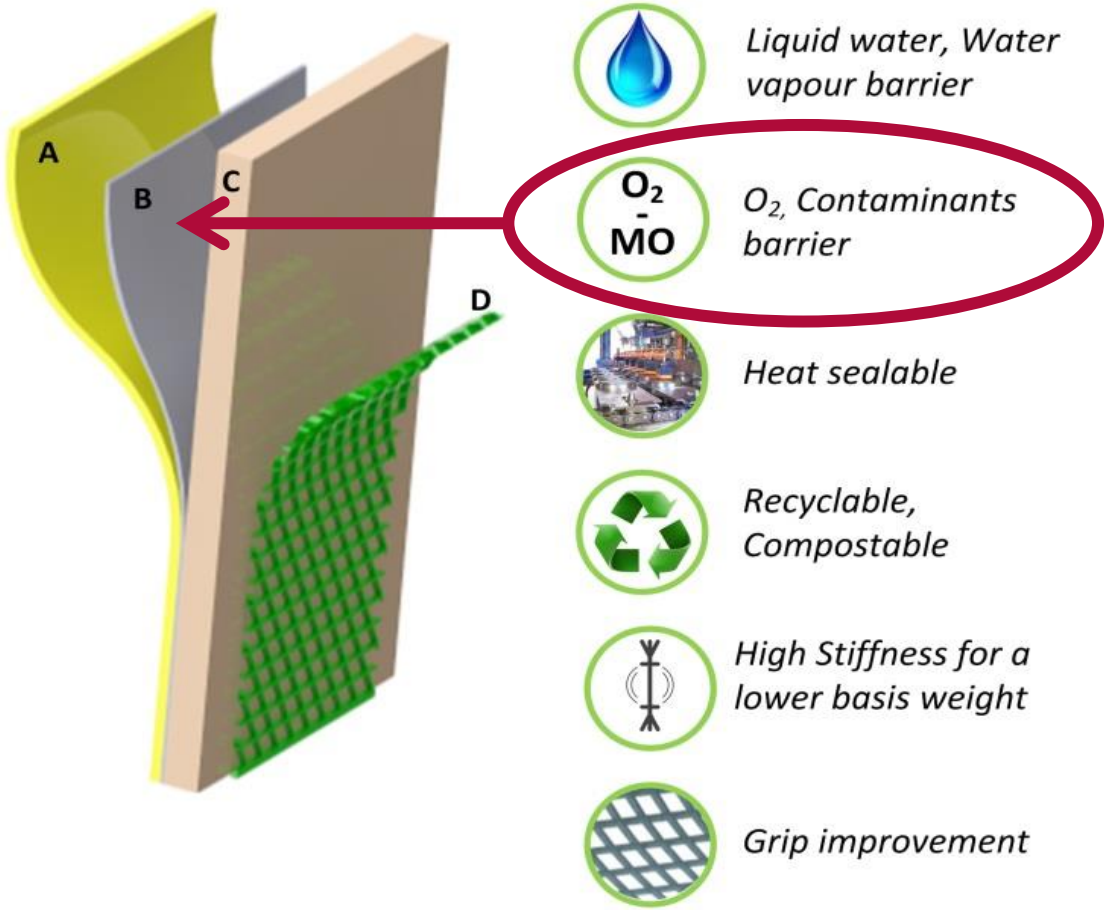
The Exilva industrial plant

- New production facility
  - Capex 23 M€
  - Initial capacity 50 000 tons (as 2%), designed for easy expanding
  - Production started in Q3-16
  - Location: Sarpsborg, Norway

- Received grant from BBIJU (EU H2020) as a flagship project
  - 25 M€ over 3 years (May 2016-April 2019)
  - Aiding on commercialization phase of Exilva

European project funded by the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement N°709746

Main objectives of Work Package 2



Barrier properties

- MFC has better oxygen and oil barrier properties than many common packaging materials

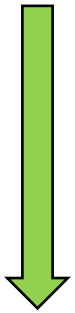
Material	Relative humidity (%)	Oxygen permeability ($cm^3 \cdot \mu m)/(m^2.d.kPa$)
MFC	0	0.011
MFC	50	3.52-5.03
PET	50	10 - 50
PLA	0	184
LDPE	50	1900

Values taken from Aulin, Gällstedt, Lindström, “Oxygen and oil barrier properties of microfibrillated cellulose films and coatings”, *Cellulose*, (2010) 17:559-574 and Padberg, Bauer, Gliese “The influence of fibrillation on the oxygen barrier properties of films from microfibrillated cellulose” *Nord Pulp Pap Res J* (2016) 4: 548-560.

Influence of MFC grade

- 1 reference from CTP
  - MFC-CTP KB3P

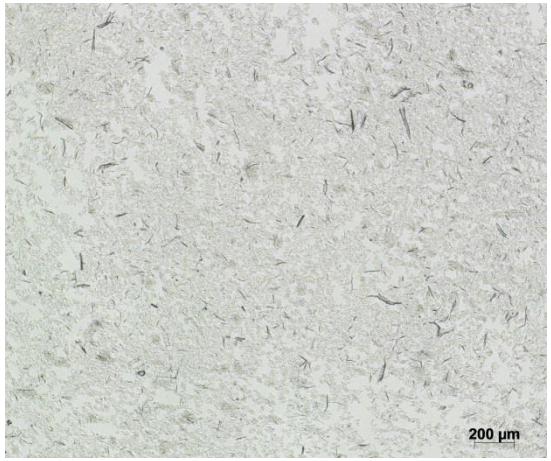
- 4 Exilva products:
  - Exilva 1
  - Exilva 2
  - Exilva 3
  - Exilva 4



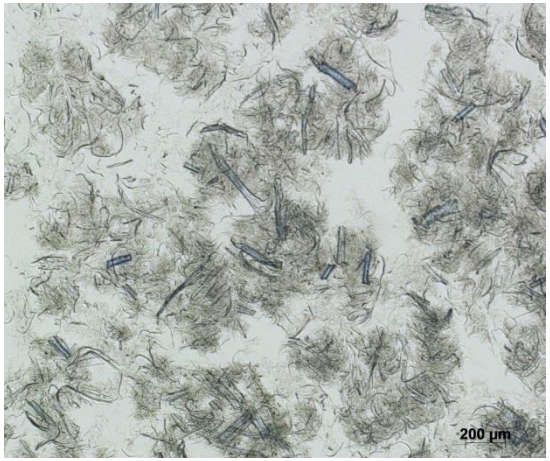
Increasing degree of fibrillation

MFC characterization

MFC-CTP KB3P

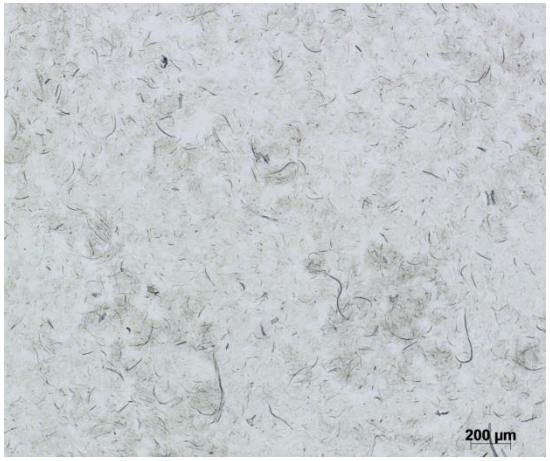


Exilva 1

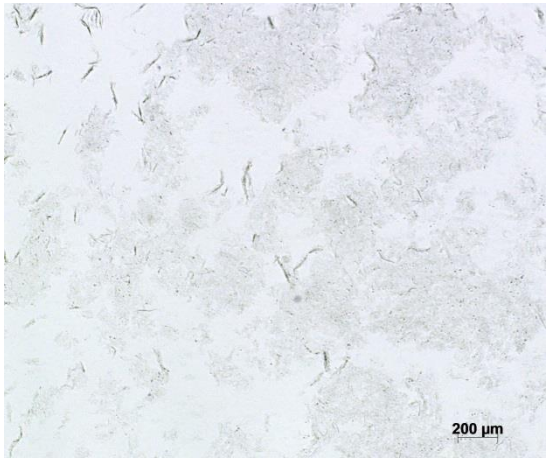


Exilva 2

Exilva 3

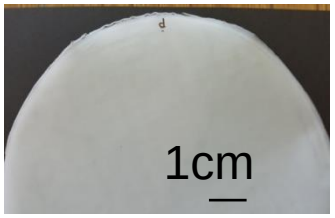


Exilva 4



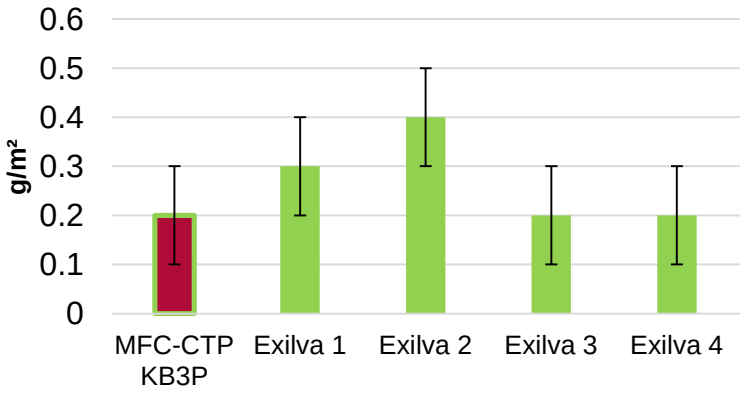
Barrier properties of the MFC films

Sample	Grammage (g/m²)	Thickness (µm)	density (calculated)
MFC-CTP KB3P	51 ±1	47	1.09
Exilva 1	50 ±1	50	1.00
Exilva 2	52 ±1	51	1.01
Exilva 3	51 ±1	48	1.06
Exilva 4	52 ±1	45	1.14

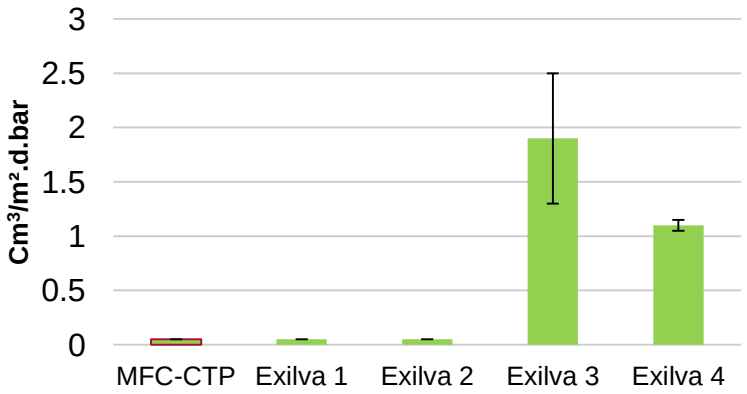


Increasing degree of fibrillation

Cobb, oil, 60s

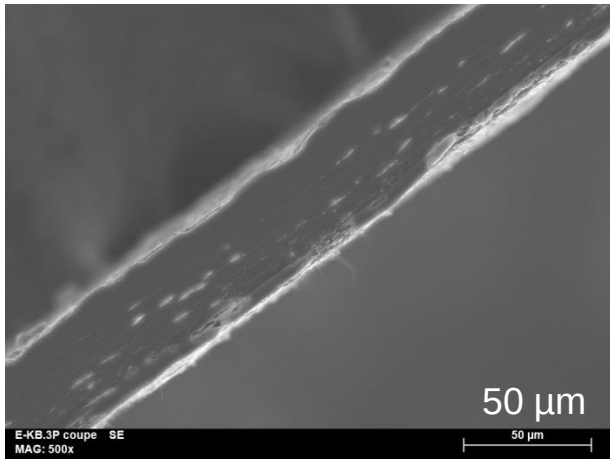


OTR, 23°C 50%RH

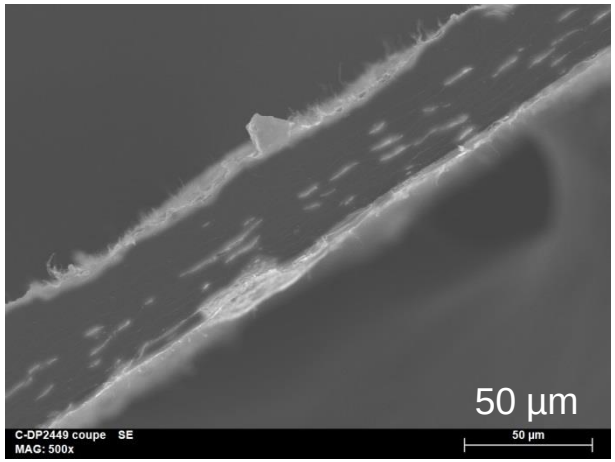


Self-standing MFC films

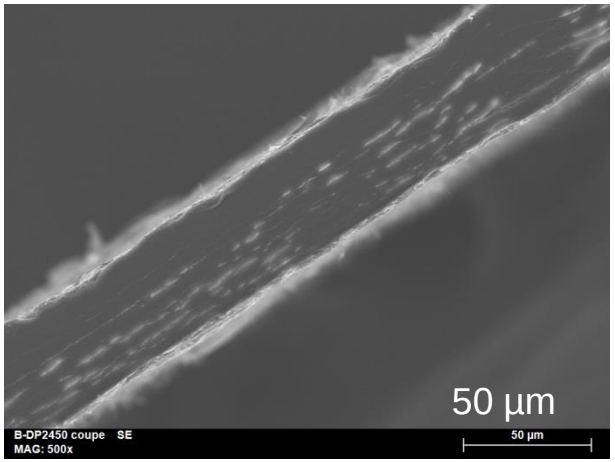
MFC-CTP KB3P



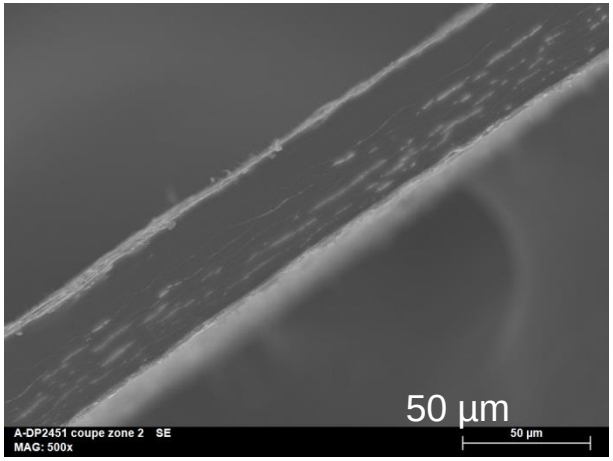
Exilva 1



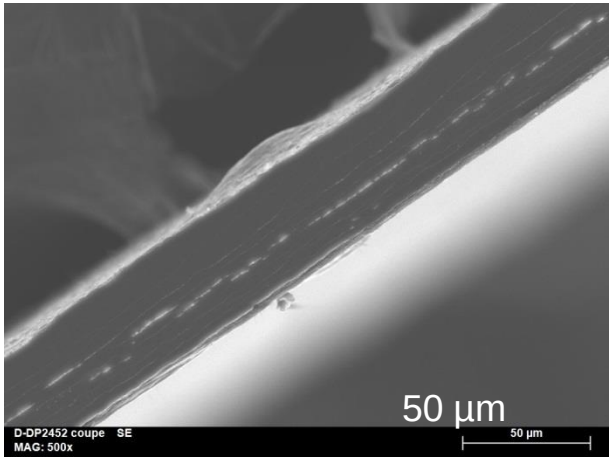
Exilva 2



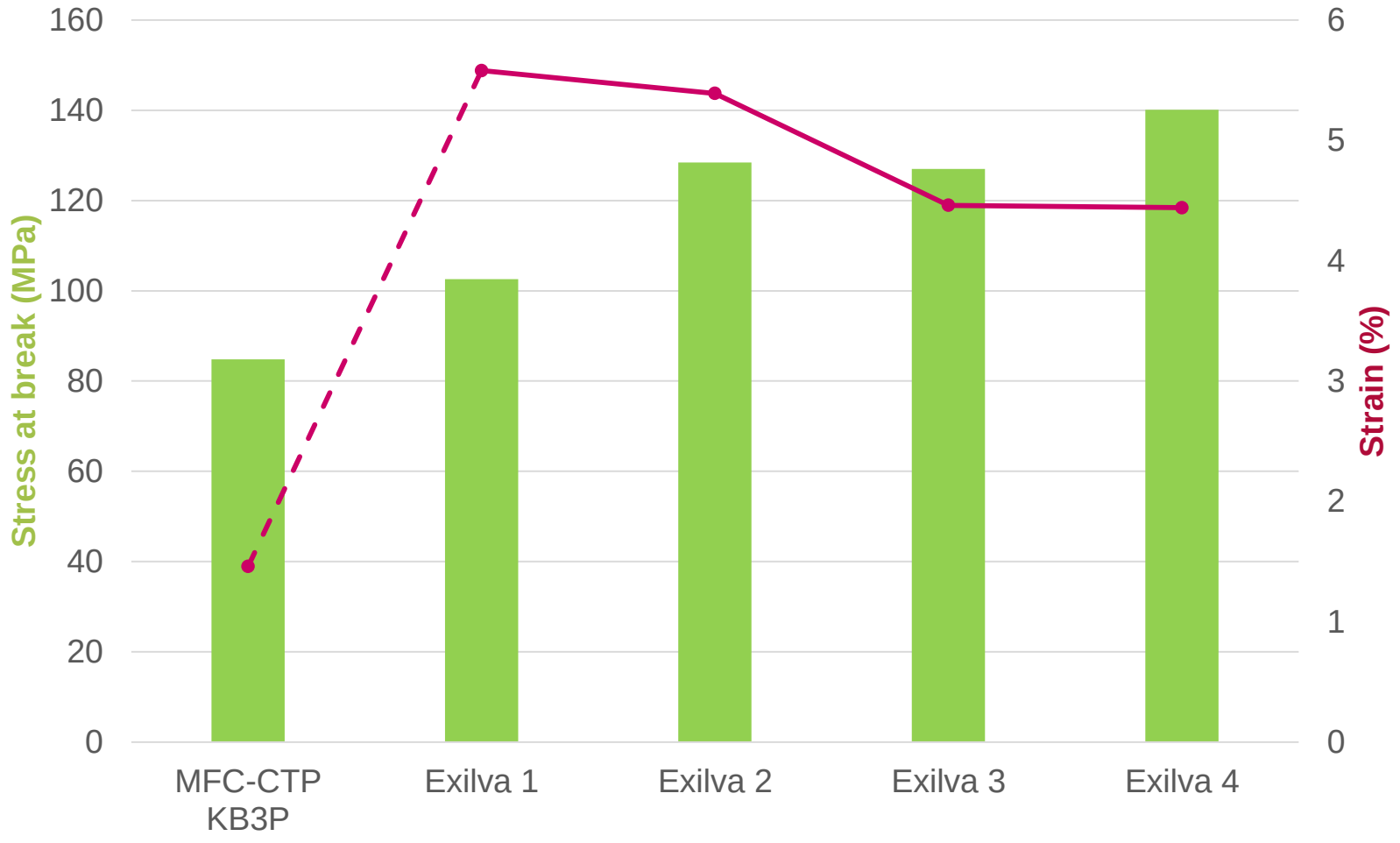
Exilva 3



Exilva 4



Mechanical properties of the MFC films



Conclusions

- Exilva, commercially produced MFC, can form films with outstanding barrier to oxygen and oil and probably to mineral oil

- The SHERPACK project will demonstrate the possibility to produce packaging materials that are **biobased, recyclable, biodegradable**, high barrier, including to **mineral oils**