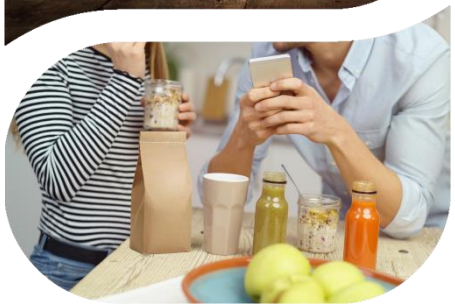
sherpack



An innovative high barrier, renewable, biodegradable and recyclable flexible paper-based packaging material

BIOECONOMY Joint Event & Training workshops Sherpack-UrBioFuture

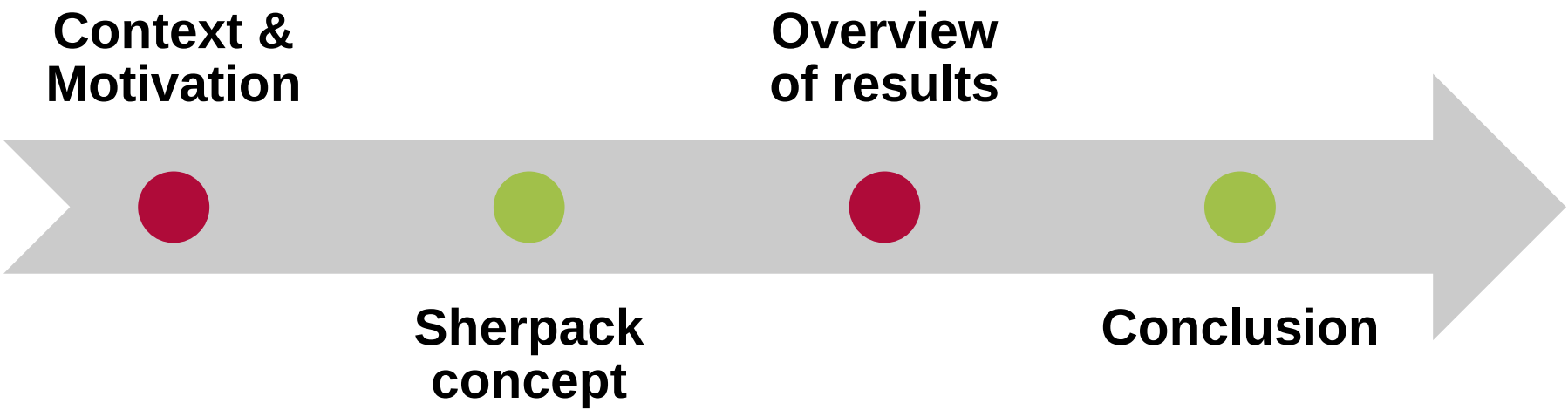
June 3, 2020, Webinar

Bio-based Industries Consortium

Horizon 2020 European Union Funding for Research & Innovation

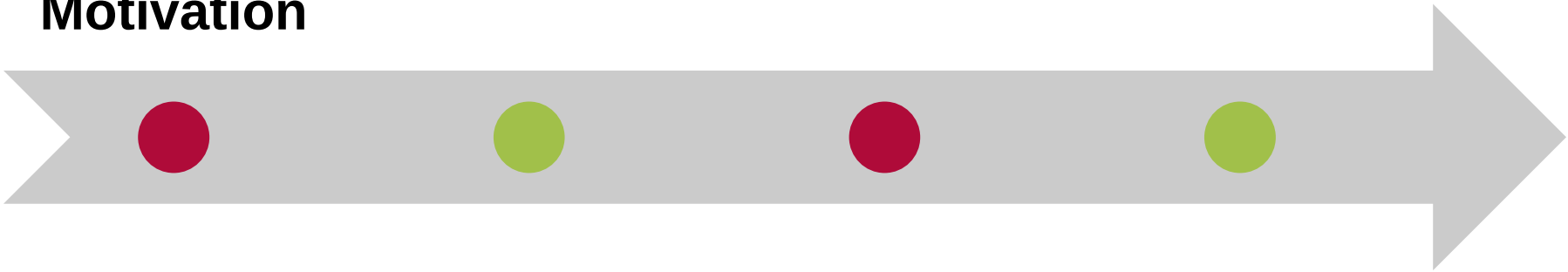
BBI JU

Outline


Context & Motivation
Sherpack concept
Overview of results
Conclusion

Outline

Context & Motivation



Paper & Board packaging

Paper for flexible packaging

- **Papers for sacks and bags**
  - Fruits and vegetables, pet food, take away
- **Specialty/packaging papers**
  - Wax/PE papers for meat, cheese...
  - Greaseproof for baking
  - Stand-up pouches

Board for packaging

- **Container board**
  - Primary and secondary boxes
  - Retail display stands
- **Carton board**
  - Food, pharmaceuticals (FBB, SBB…)
  - Dry food, tools, electronics (WLC)
  - Milk, juice, aseptic products (LBP)

The role of primary packaging

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Contains and protects

Need to ensure **consumers' safety**

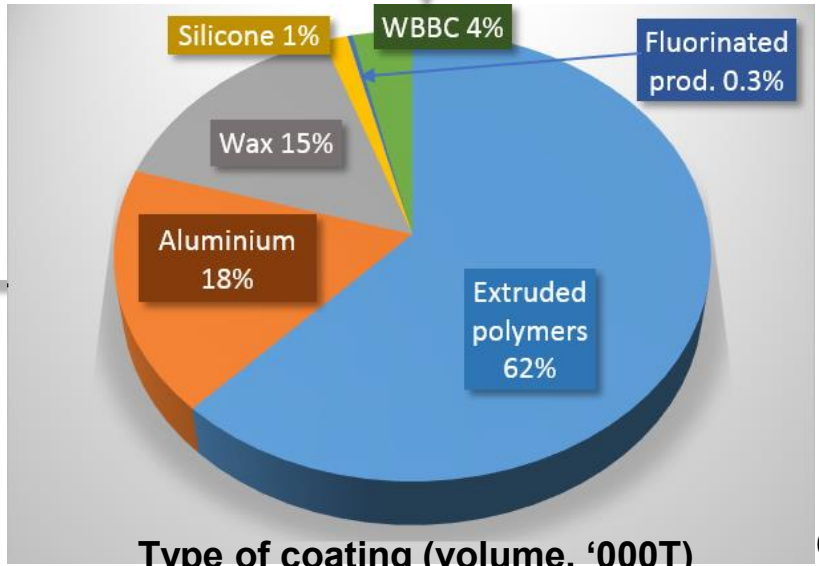
Adapted to specific requirements of the product

Most varied and demanding barrier

Motivations

Best environmental ranking
Worst barrier performances
before converting

Necessary to transform cellulosic substrates



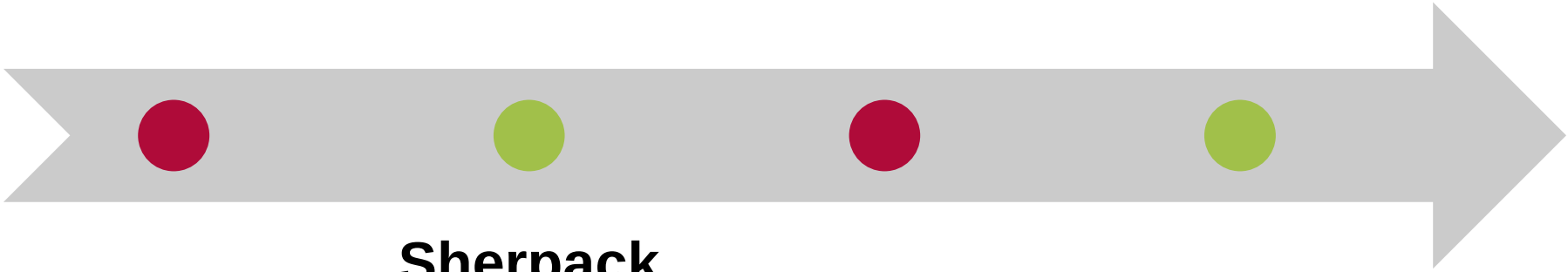
Type of coating (volume, '000T)

[Source PIRA, 2017]

Market trends

- Phasing out of PE and aluminium
- Biobased materials
- Recyclable materials
- Removal of fluorinated compounds
- Functional single-serving packaging

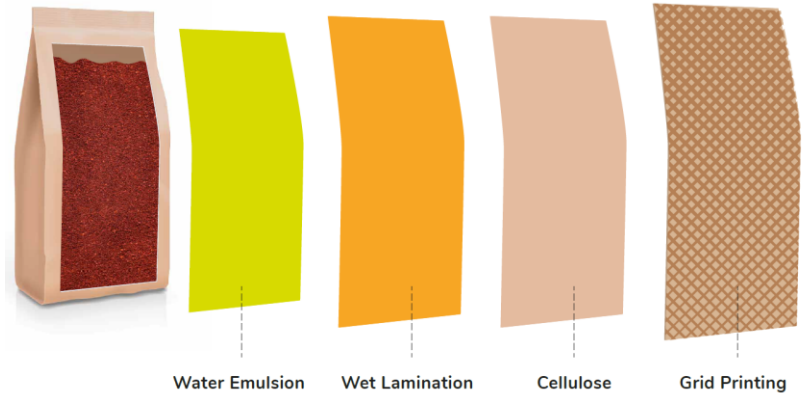
Outline



Sherpack concept

Sherpack: Concept & Consortium

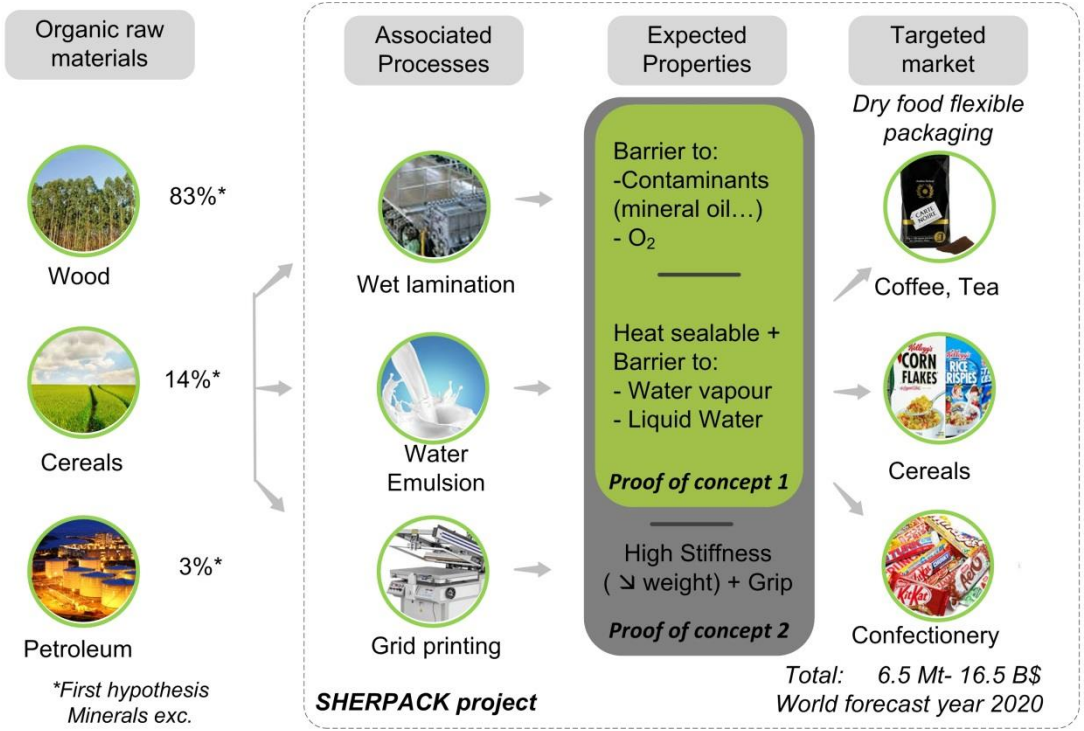
Development of a renewable, biodegradable and recyclable flexible paper-based packaging material that can be converted by heat-sealing and folding, with improved stiffness and grip.

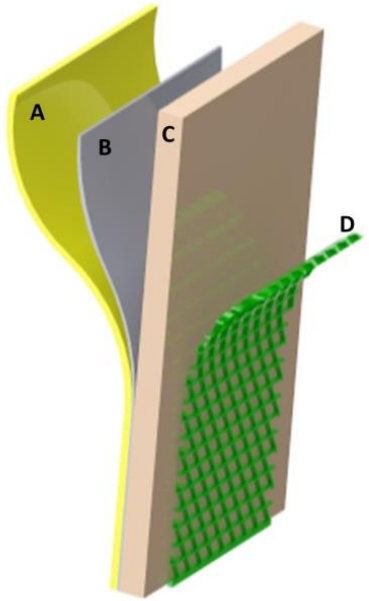


2017 – 2020

www.sherpack.eu

Targeted markets and proof of concept





Proof of concept 2

Liquid water, Water vapour barrier

O_2, Contaminants barrier

Heat sealable

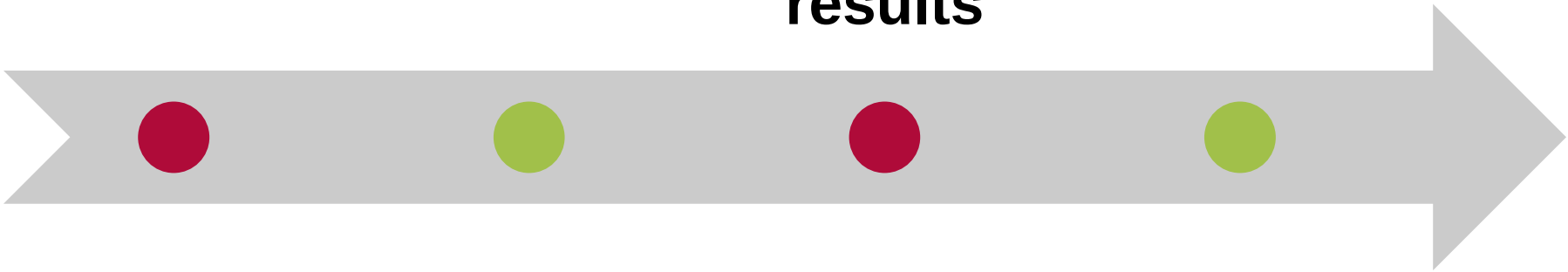
Recyclable, Compostable

High Stiffness for a lower basis weight

Grip improvement

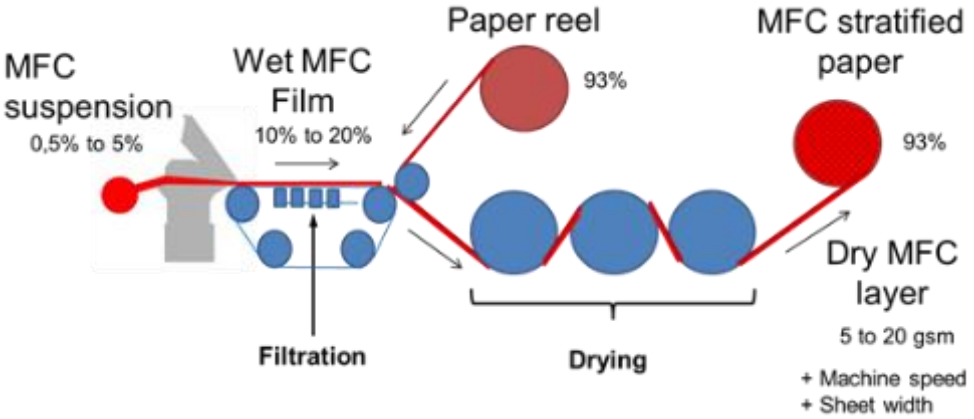
Outline

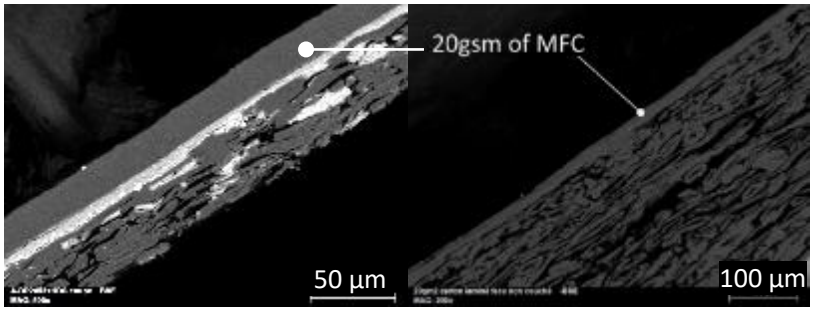
Overview of results



Wet-lamination concept

- Process and device for manufacturing a laminated material comprising a fibrillated cellulose layer



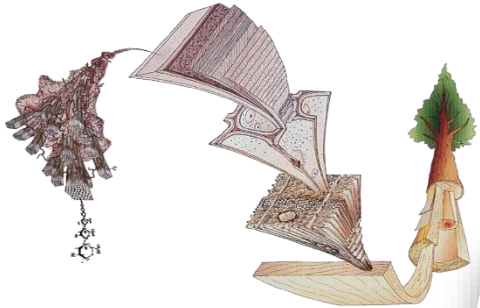


Paper Board

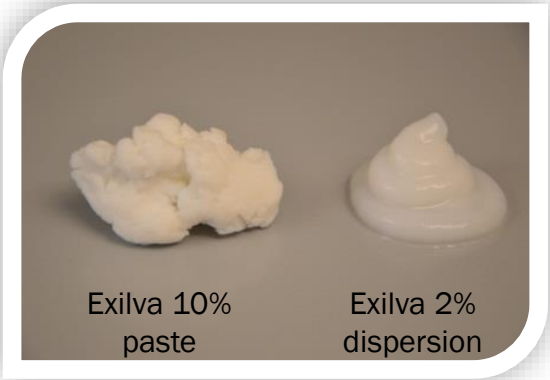
Patent WO2016174348 B1

Exilva - A new product from Borregaard

- Microfibrillated Cellulose (MFC)
- High available surface area with functional OH groups



Source: Harrington (1996)
Univ. Of Canterbury

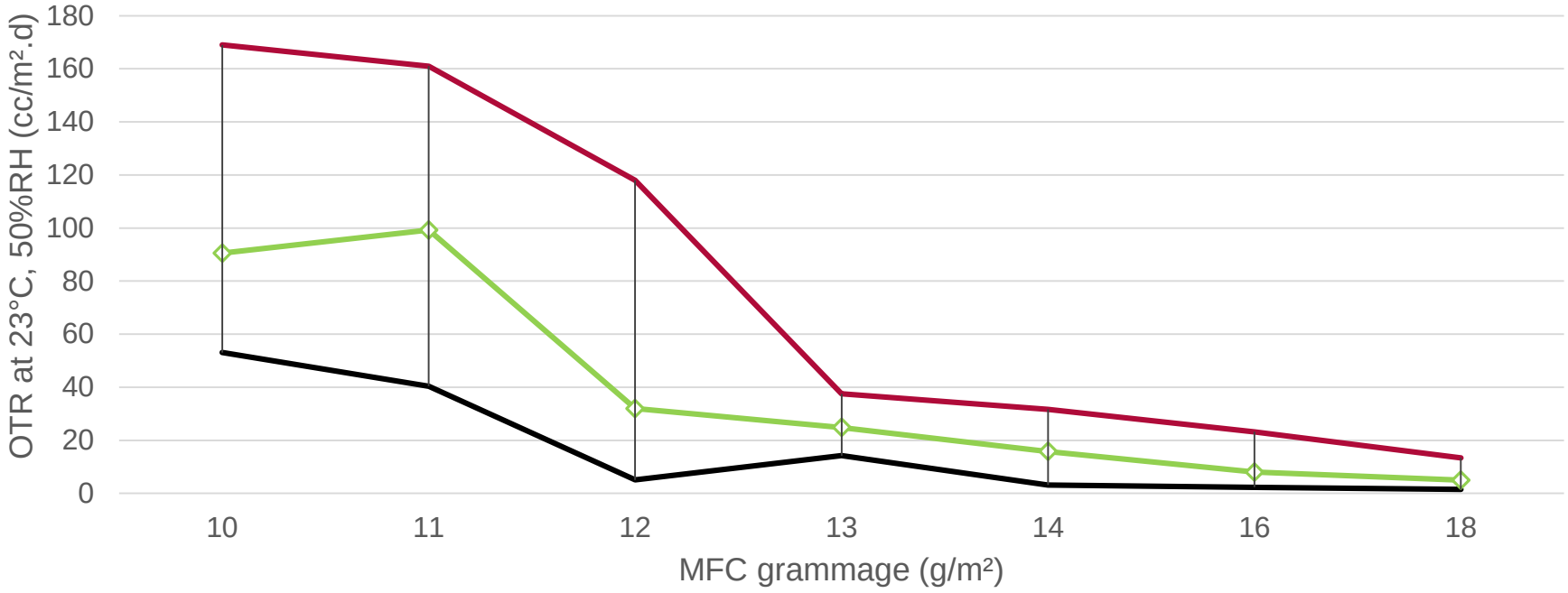


- Advantages
  - Biosourced, biodegradable, recyclable in conventional paper recycling streams
  - **Bring excellent barrier to grease, oxygen, contaminants**
- Drawbacks
  - Low solid contents
  - Highly viscous ➔ traditional coating processes not adapted

MFC grammage: impact on oxygen barrier

Exilva Piano wet-laminated on Gerstar HDS

Values>500cc/m².d excluded - based on 4 values or more

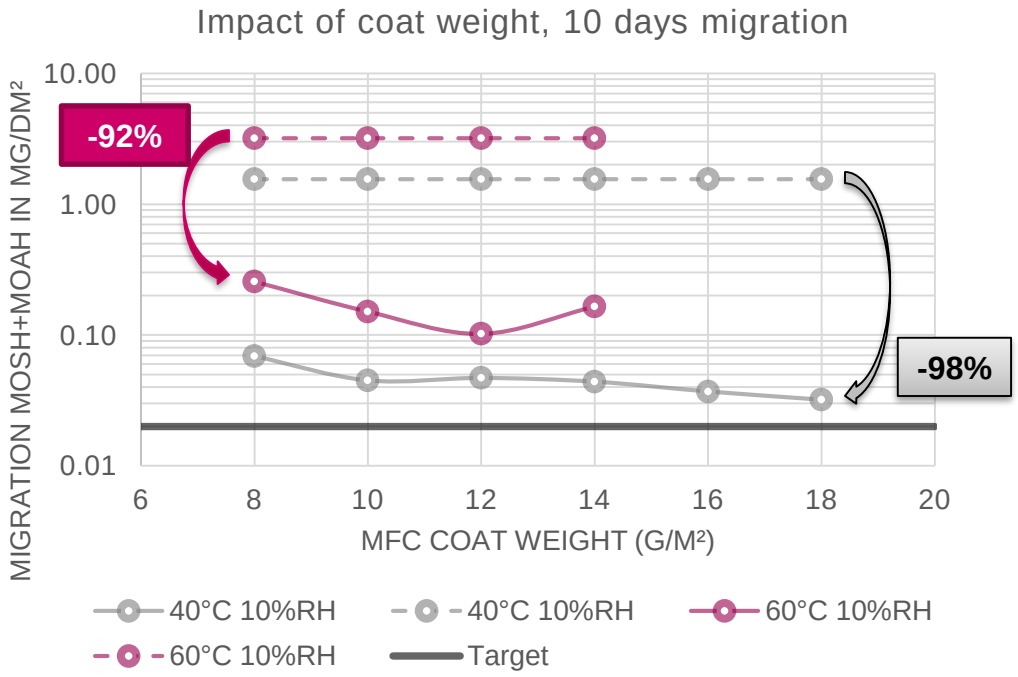


Barrier to contaminants

- Mineral oil barrier efficiency
  - MOSH and MOAH are the substances that migrate the most and the most easily for light fractions
    - Migration of MOSH and MOAH from a donor material through the barrier into Tenax to simulate dry contact

Barrier to contaminants - Impact of MFC Coat Weight

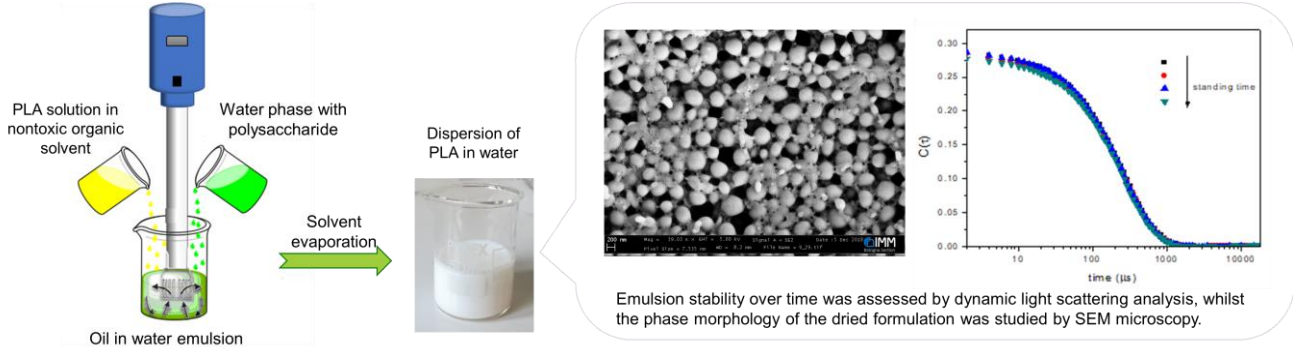
NB: Log scale



- Reduction of migration between 92-98% overall
- Clear impact of MFC coat weight on migration
- Ambitious target of 0.02 mg/dm²
  - Almost reached even with important amount of mineral oil in the donor
  - Total migration of 0.03mg/dm² for 18g/m² MFC coat weight
    - Lower in reality due to migration below LQ

Biopolymer emulsion

- Brand new green process developed by ISOF to obtain a waterborne poly(lactic acid) (PLA) based formulation
  - Mixing under high energy a PLA solution in a nontoxic, nonchlorinated solvent with a water solution of surfactants
  - Evaporation of the organic solvent ➔ stable sub-micrometric sized (≈ 200 nm) polymer dispersion

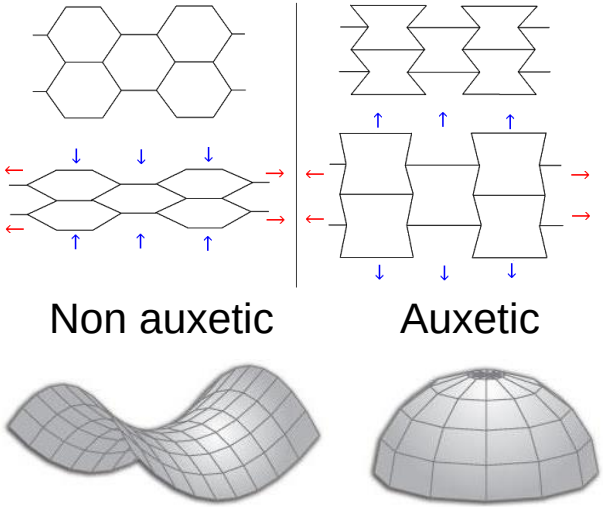


Emulsion stability over time was assessed by dynamic light scattering analysis, whilst the phase morphology of the dried formulation was studied by SEM microscopy.

- Emulsion complies with food contact regulations in Europe
- Water vapour barrier is improved

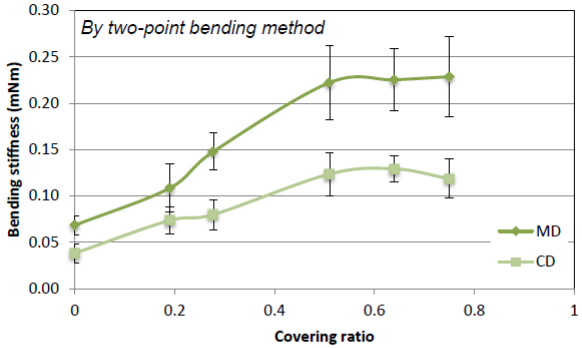
Polysaccharide grid printing

- To print a starch-based grid on the paper surface
  - with optimized covering ratio and pattern design
    - inspired from auxetic cellular materials

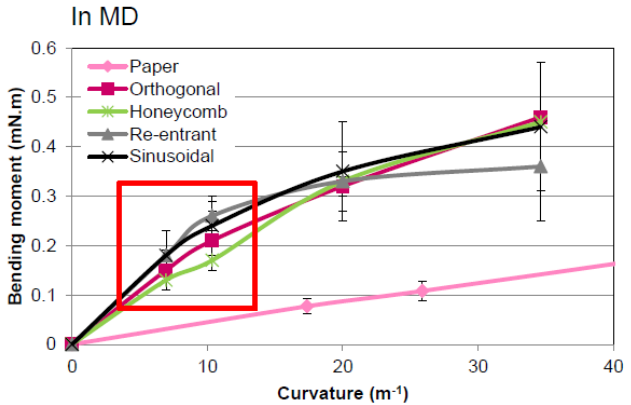


Polysaccharide grid printing

- Screen-printing of starch-grid on the paper surface
- Starch formulation
- Several patterns investigated



➔ Huge improvement
- ✓ Bending stiffness x2 at 30% covering ratio
- ✓ x3 at 50% covering ratio

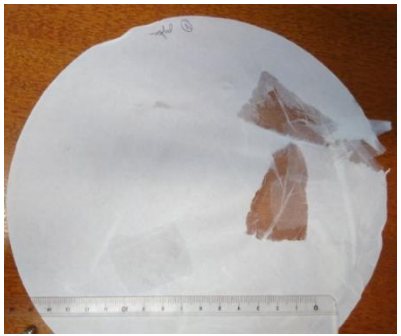


➔ Performance in bending impacted by the pattern design

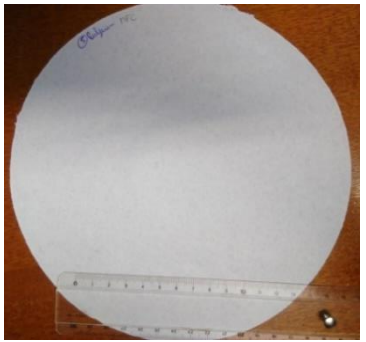
Recyclability & Compostability

Sample references	Visual aspect of handsheets (no screening)	Somerville rejects, %
Paper/PE	Presence of plastic film	20 %
Paper/Alu/PE	Presence of alu film	50 %
Gerstar HDS	Very good visual aspect	<1 %
Gerstar HDS + 18g/m² Exilva	Very good visual aspect	<1 %

PE/Paper – no screening

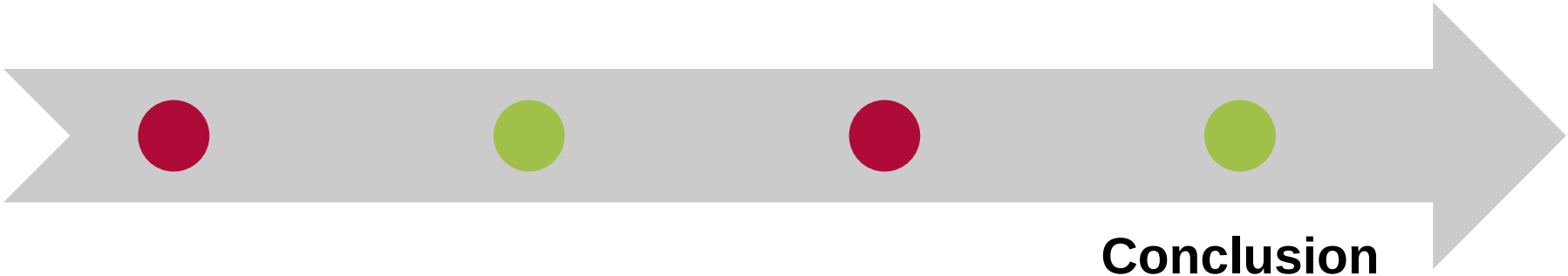


MFC/Paper – no screening



- Biodegradability at lab scale
  - Reference material: Cellulose
  - Tested material: Gerstar HDS + 18g/m² MFC (Exilva)
- Results: the samples are biodegradable
  - **100%** Biodegradation degree with respect to the reference after 50 days

Outline



Conclusion

Conclusions

- MFC coated on paper using the wet-lamination process provides outstanding barrier properties to grease, oxygen, and mineral oil
- Printed grid provides significant increase to mechanical properties

- New packaging material
  - Biobased
  - Recyclable in the paper stream
  - Compostable

- **Packaging of the future, will integrate well in a circular economy concept**

Targeted market

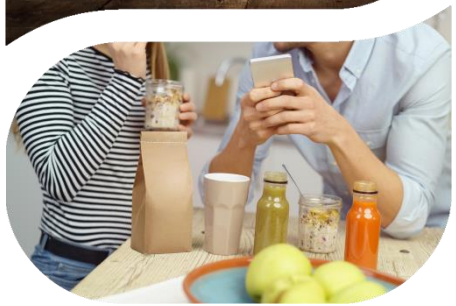
Dry food flexible packaging

Coffee, Tea

Cereals

Confectionery

sherpack



Thank you for your attention

Any question?

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Bio-based Industries Consortium

Horizon 2020 European Union Funding for Research & Innovation

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