
pond®
Biobased and biodegradable resin for bio fibers

Composites

We come from the composite industry

Composites from polymer matrix and glass/carbon fibres

- Composites can be used to reduce CO_2 in transportation and energy sectors
- In Europe 400,000 tonnes composite were landfilled in 2012
- Our purpose is not to make things better, but greener

Bio-composites

Natural fibre fabrics have been commercially available since ~2000

Composites with natural fibres and crudeoil matrices have been researched and commercialised

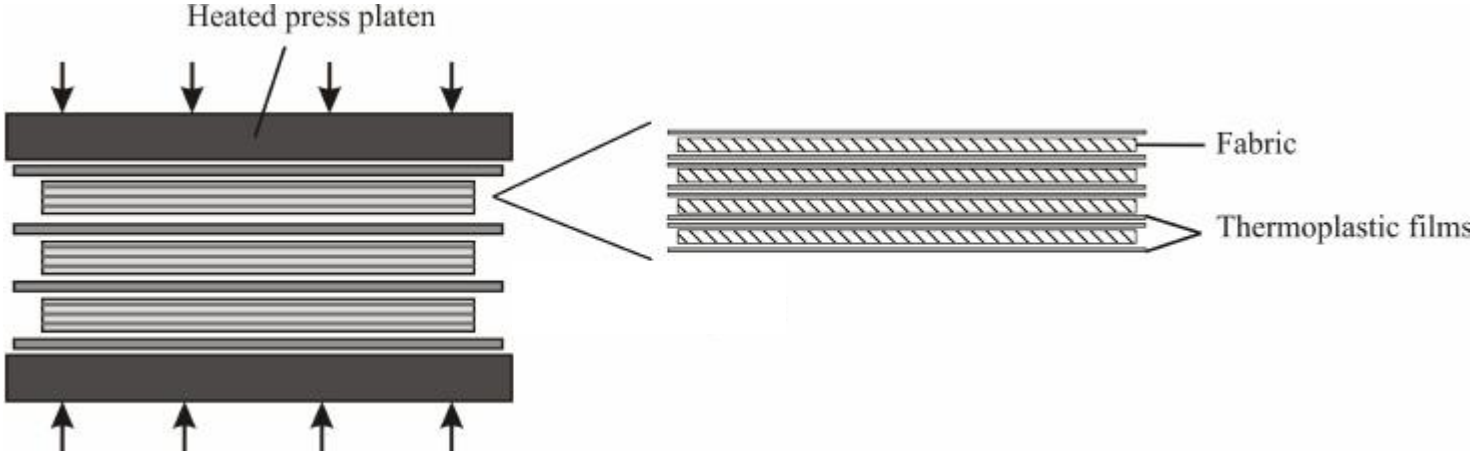
So we are half way to the goal

Scope of work

The present work is a comparison for compression moulded composites

Fast specimen production – industrial relevance

Using sheets of thermoplastic resin



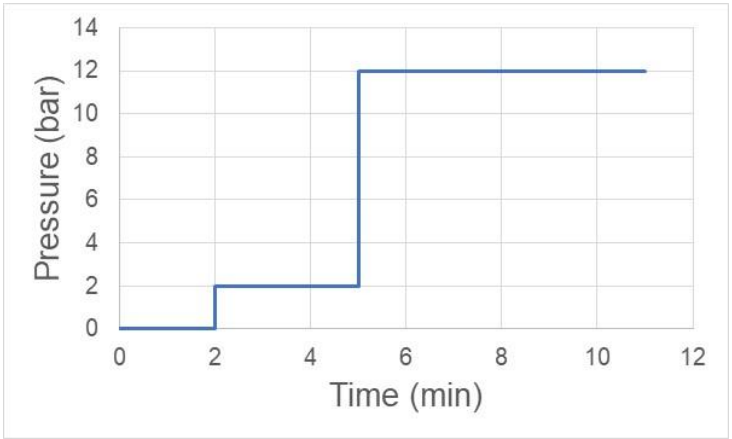
Experimental setup

Reinforcement: 300 gsm UD flax fabric from Bcomp

Matrix: Pond biopoyester sheet or polypropylene sheet

Layup: 9 plies of flax fibres with resin sheets with enough resin for 55wt% resin content (excess trimmed)

Compression moulded at 175 °C



Fiber fraction

Fibre fraction detmined from final weigth and used flax fibre

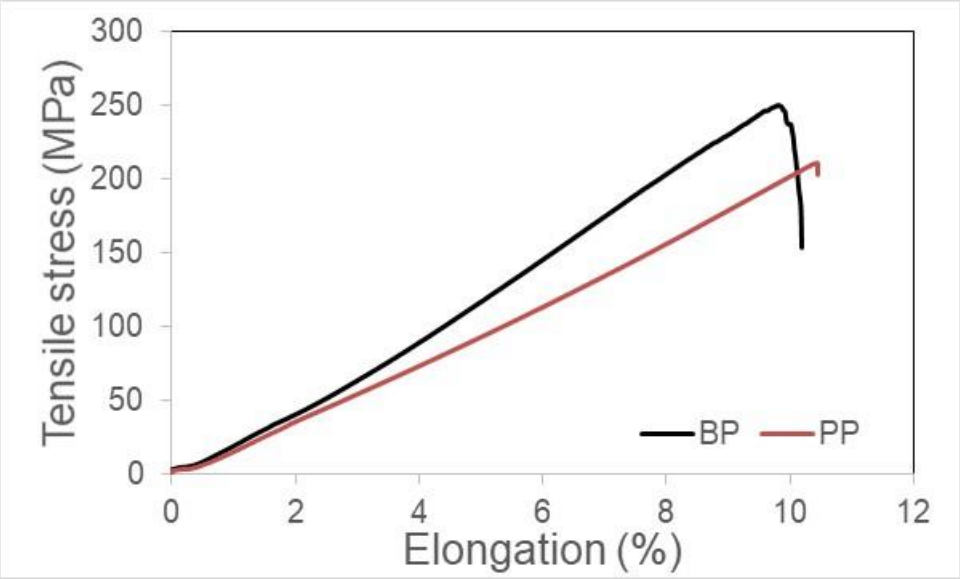
Fibre farction	Flax	Dry flax
Biopolyester	51.1±2.4	54.0±0.7
Polypropylene	49.3±1.5	49.4±0.9

BP giving 3-9 % more fibre content than PP

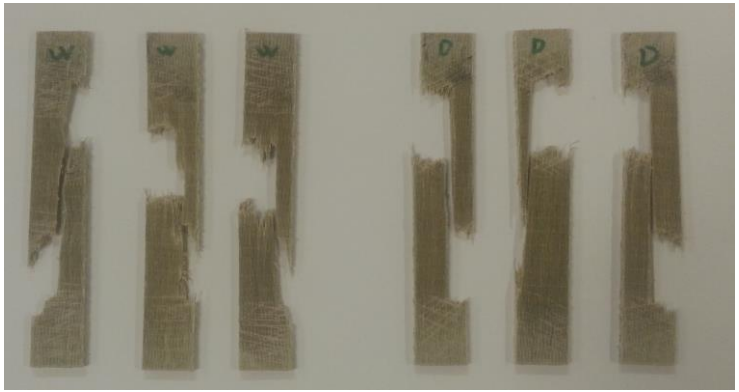
Seems to be a positive influence from drying

Tensile properties

Properties dominated by fibres



BP



PP

Tensile properties

Tensile Strength (MPa)	Flax	Dry flax
Biopolyester	221.8±14.2	247.9±7.8
Polypropylene	192.9±12.6	221.5±9.1

Better strength when using biopolyester and drying

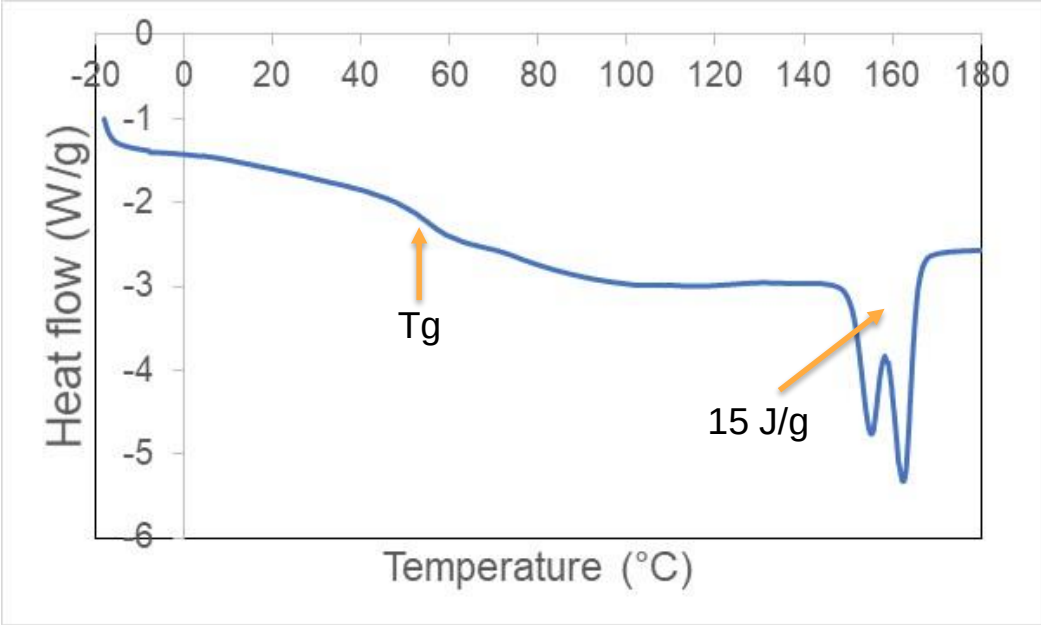
12-15 % increase for BP – higher than fibre fraction increase

Elongation at break(%)	Flax	Dry flax
Biopolyester	9.5±0.8	10.0±0.4
Polypropylene	9.9±1.5	10.8±0.4

Drying increases elongation and PP slightly better. Water creating voids?

DSC of composite

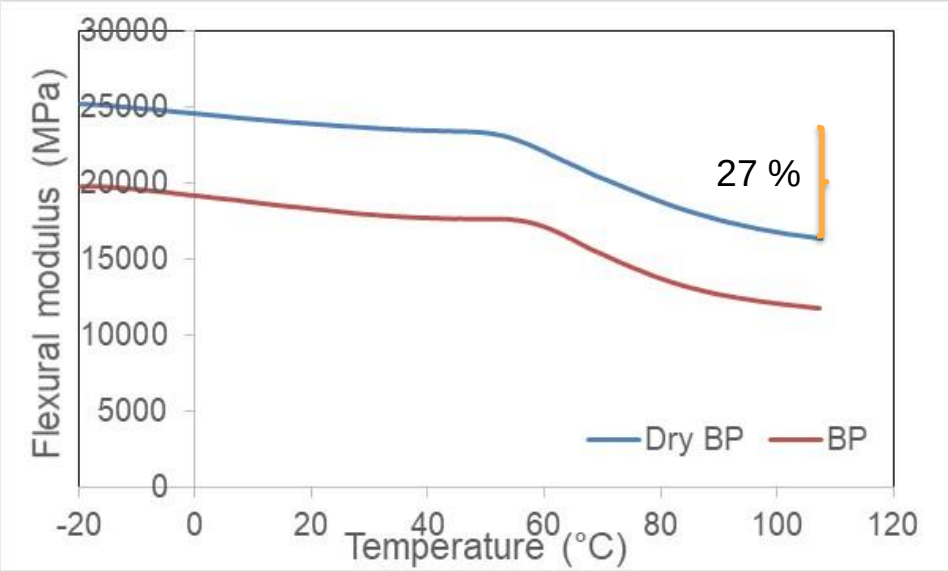
Tg and crystallinity important for temperature stability



Approximate 32 % crystallinity of matrix phase

High temperature performance

Important for automotive interior



Drop at Tg, but crystallinity gives high temperature stability

68 % amorphous phase, but only 27 % drop in modulus after Tg

Summary

The pond biopolyester is a suitable matrix for thermoplastic composites

- Better mechanical properties than PP – better interface
- Good performance at high temperature

Fully bio-based composites

Higher consolidation pressure can yield higher strength

Acknowledgement to Martin Kristensen
AAU for performing experiments