FLOWER

Flax composites, LOW weight, End of life and Recycling

Deliverable n°1.1.1

CATALOGUE OF RAW MATERIALS
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PP LEADER UBS

Interreg

France (Channel Manche) England

EUROPEAN UNION

European Regional Development Fund

Partners

PP Leader: UBS

Partners involved: ECOTECHNILIN, KAIROS, INRA

Objective of the deliverable

This deliverable is dedicated to the choice of appropriate fibres, whatever flax or polymer in order to manufacture a suitable non-wovens for the applications of Kaïros and Howa-Tramico. Regarding flax fibres, average properties and bill of specifications of fibres are exhibited and discussed; for biopolymer a range of possible matrices is defined and properties shown.

Content

❖ Flax fibres

▪ Bill of specifications and needs

To manufacture non-woven, it is necessary to use flax tows for several reasons. They exhibit a range of fibre and bundle diameter which has an interest, especially for the Tramico's application, the heterogeneity being interesting for acoustic and thermal insulation behaviour. This diversity into morphological parameter has also an interest regarding the cost which is lower when tows are little processed and low individualized.

In the case of Kaïros, things are different because having a perfect state of surface of the compressed parts is the main technical objective; thus, for this application the objective is to obtain batches of flax tows with very low content of shives.

Thus, three quality of batches are defined, in a first approach, for the non-woven prototypes manufacturing. Table 1 synthetizes the needs.

Sample	Content of shives (%)	Length of fibre elements
1	0%	70-80 mm
2	<5%	70-80 mm
3	>5%	70-80 mm

Table 1: First samples provided by DEPESTELE for non-woven prototyping

- **Mechanical properties of flax fibres**

  Mechanical properties of flax fibres and tows are one of the main parameters for the reinforcement. Whatever for Howa-Tramico and Kaïros applications, one of the aim of the flax fibres within the structure is to reinforce and improve the mechanical performances of the structures.

  Figure 1 synthetizes the average properties of flax fibres, these results are an average of 50 flax batches mechanically tested along 20 years in UBS laboratory.

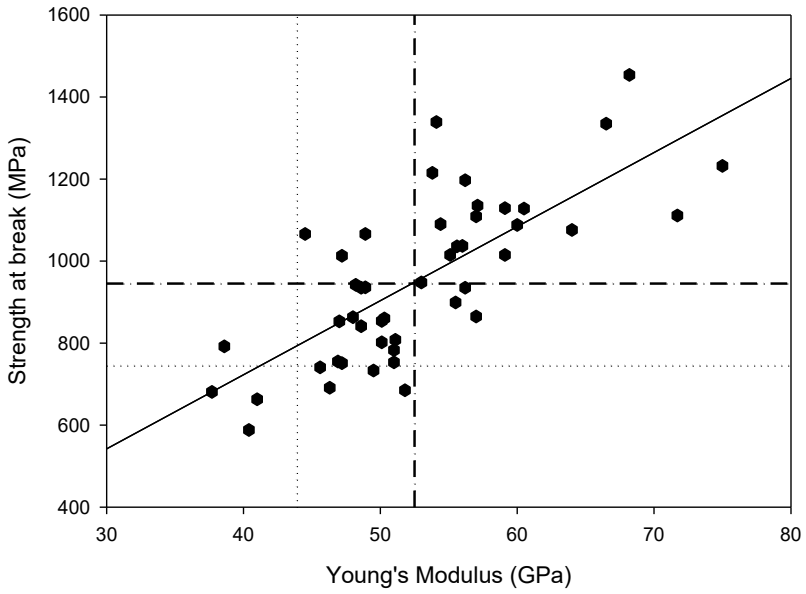

Figure 2: Average mechanical properties of flax fibres (Baley & Bourmaud, 2014)

To achieve the mandatory properties of the non-wovens, batches of selected tows must have mechanical properties in the same range.

❖ Biodegradable polymers

- **Objectives**

  For the selection of polymers, two main objectives are needed; processing of polymers into yarns by extrusion must be possible and these polymers must also be biodegradable to achieve the objectives of Kaïros regarding the end of life of the products.

  Thus, a range of biopolymers was defined and ordered for first tests. Table 2 presents the

Short of polymer	Reference	MFI supplier (g/10min)	Tm supplier (°C)
PP	PPC_10642	44 (230°C, 2,16kg)	165
PPgMA	Orevac CA100	10 (190°C/0.325 kg)	167
PLA	3001D	22 (190°C, 2,16kg)	200
PBS	FZ71PM	22 (190°C, 2,16kg)	115
PBAT	C1200	2.7-4.9 (190°C, 2,16kg)	110-120
Potatoes' starch	bioplast 400	7.5 (190°C, 5kg)	NDA
PHA	PHI 002	15 - 30 (190°C/ 2,16kg)	NDA
PBS	PBI 003	20 (190°C/ 2,16kg)	NDA

Table 2: main properties of selected polymers. PP is used as a reference

NEXT STEPS

- Investigations of the properties of fibres: mechanical, morphological properties, presence of defects and individualization
- Study of rheological, thermal and mechanical properties of polymers
- **Deliverable 1.2.1.** Catalogue of properties of selected materials