



FLHEA

Flax and Hemp advanced fibre based composites

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Dissemination level

PU	Public	✔
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

A novel biodegradable packaging was developed in a recent FP7 European project called FLHEA. The project, coordinated by ITENE, was approved in 2013 FP7 call, within the Topic: KBBE.2013.1.4-07: Boosting the translation of FP projects' results into innovative applications in the field of agriculture, forestry, fisheries and aquaculture. It has a international consortium of 7 partners that include research institutes, companies (also SMEs) and university: ITENE-Packaging, transport and logistics research institute (Spain), Arctic Fiber Company Ltd(Finland), Melodea (Israel), University of the Basque Country (Spain), Organoclick (Sweedeen), Rodenburg Biopolymers (Netherlands) and Termoformas del Levante (Spain). Its main objective is to develop a sustainable cost competitive packaging material using biodegradable fibre-based composites that could be processed with commercially available thermoforming lines.

To achieve this target, as first step the cellulose pulp was produced from different pretreated hemp and flax raw materials. After analyzing the properties of obtained pulps, Enzymatically retted long flax fiber was selected as raw material for the extraction of cellulose nanocrystals. An optimized procedure was developed to produce nanocrystalline cellulose (NCC) from pulp. To enhance the compatibility between the biopolymers matrixes and the NCC several surface modification based on click-chemistry were achieved. Modified and non modified NCC were used as additive in different biopolymer (Polylactic acid (PLA); starch, ...) to produce the biocomposites with different content of NCC. Different processing methods were tested to enhance the dispersion of NCC inside the biocomposite to improve the mechanical and barriers properties of the material.

Biocomposites with best results were used to produce packaging demonstrators at industrial scale. Obtained results in term of mechanical properties and barriers properties are promising toward the development of sustainable and biodegradable packaging material that could substitute presently commercialized products in near future.

The main achievements of the FLHEA's project are:

- The project successfully developed a new material ready-to-use in available industrial production lines.

- The incorporation of NCC provides a biodegradable material that can replace synthetic materials while improving oxygen and moisture barriers.
- The addition of small amount of modified NCC improved - the mechanical and thermal properties of the composite.
- The addition of modified NCC to the PLA matrix increases the deformation at break by 10 % approximately.
- The introduction of modified NCC in PLA matrix produces an increase around 30% in oxygen barrier properties.
- The trays made of PLA, plasticizer and modified NCC show a higher deformation compared to trays without NCC.
- The overall migration results obtained meet the overall migration limit Regulation (UE) 10/2011 on plastic materials and articles intended to come into contact with food.
- The materials employed in the FLHEA project fulfill the requirements of the Plastic Regulation (UE) 10/2011 concerning composition.