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► **To cite this version:**

Maya-Sétan Diakité, Hélène Lenormand, Vincent Lequart, Patrick Martin, Romain Roulard, et al.. Hemp shiv extraction by process parameters simulation -An application in building engineering. The European Polysaccharide Network of Excellence (EPNOE), Oct 2021, Nantes (France), France. hal-04580760

HAL Id: hal-04580760

<https://hal.science/hal-04580760>

Submitted on 20 May 2024

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Hemp shiv extraction by process parameters simulation – An application in building engineering

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The necessity of building materials improvement led to reconsider lignocellulosic biomass as a tool to upgrade materials characteristics (thermal and acoustical insulation, environmental impact, air quality...). Thus, current studies are focusing on plant valorization into materials like biobased mortars and particles boards. However, the invariability of synthetic building materials submitted to international standards compared to plant variability unsubmitted to these rules, need to be investigated to upgrade materials characteristics.

According to literature, molecules like sugars or polyphenols are highly released during processing methods. These molecules can contribute to delay rigidification in mortar [1;2] or can permit interactions between plant aggregates in binderless particles boards [3]

Thus, a better understanding of plant biomass and plant released molecules during process are required to get those mechanisms and by extension better add value products. In this way, this work will be focused on hemp shiv and split into three main parts;

- Plant cell wall composition has been investigated by Van Soest method [4] and sequential extraction.

- Process parameters simulation focus on pH and temperature have been carried out on hemp shiv to extract similar compounds released during bio-based materials production [1] (Table 1).

- These extractives, acid and neutral sugars have been measured [5] and High-Performance Anion Exchange Chromatography with Pulsed Amperometric detection (HPAEC-PAD) analysis was performed for dosing each sugar [6;7].

| Hemp shiv FEDORA17 | | | | | | | |
|-------------------------------|----------|------------|-------------|-----------------|-------------------|--------------------------------|----------------------------------|
| Process parameters simulation | Water RT | Water 50°C | Water 100°C | pH 12,5 NaOH RT | pH 12,5 NaOH 50°C | pH 12,5 Ca(OH) ₂ RT | pH 12,5 Ca(OH) ₂ 50°C |
| | | | | | | | |

Table 1. Extraction method of extractives compounds by process parameters simulation

This study proposes an improving materials formulation process by providing a better understanding of plant released molecules.

Key-words: Hemp – biomaterials - building - extractives - process – simulations

Acknowledge: Authors would like to acknowledge funds provided by CABBALR, GoLaSalle project and Normandie PhD School (NBISE).

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