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TOPIC(s) : Biomass conversion

Development and characterization of a biosourced additive with surface-active properties for eco-insulating materials

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PURPOSE OF THE ABSTRACT

Foam concrete (FC) is a type of cement mortar composed of a binder (cement or gypsum), water and mineral foam [1]. In recent years, it has become an interesting alternative to ordinary concrete, it is increasingly used in environmentally friendly buildings, due to its interesting characteristics such as low density (400-1850 kg/m3), high fluidity, low cement content, low use of aggregates, excellent thermal insulation and the ease of its production process, from the manufacturing plants to the final position of applications [2].

The realization of this type of concrete requires the introduction of a foaming agent in their manufacturing formula. This additive offers a porous character to this type of material, inducing interesting thermal and acoustic performances by reducing heat transfer and increasing sound absorption [3]. However, most foaming agents currently used in the industry are derived from depletable and non-renewable fossil resources, so the use of biobased materials represents a key solution to decrease the energy and environmental footprint of the building sector.

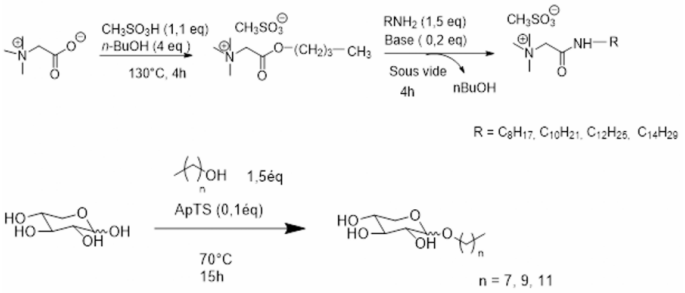
In this context, this research work is part of an ecological approach to sustainable development and aims to create a mineral insulating foam with low environmental impact and energy savings. The objective of this work is to optimize a mineral-organic foam based on flax shives, developed by the laboratory [4], and to replace the foaming agent used in the formula, by an alternative from renewable resources using a regional biomass.

A series of surfactants has been developed at the Transformations & Agroressources unit (UTA). These molecules have been synthesized respecting as much as possible the principles of green chemistry. The hydrophilic part is derived from monosaccharides such as D-xylose, amino acids such as glycine, glutamic acid and betaine (Figure 1) [5] [6].

The developed amphiphiles were used as foaming agents in the formulation of an insulating foam developed at the Civil Engineering and Geo-Environment Laboratory (LGCgE) Artois site (Figure 2).

Referring to an insulating foam prepared by a petroleum-based foaming agent, among the 20 molecules tested only 6 molecules from betaine and D-xylose gave promising results in terms of foaming activity and stability of the foam. Preliminary results concerning the synthesis of amphiphiles as well as their physicochemical and surface-active characterizations and their material applications will be presented here.

FIGURES



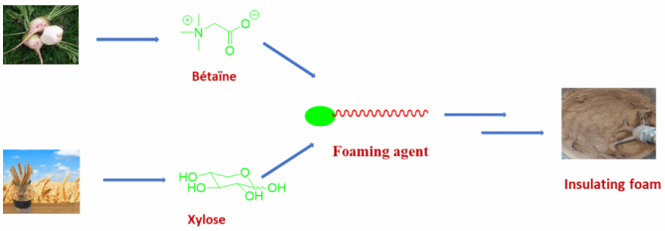


FIGURE 1
Synthesis strategy for amphiphilic derivatives [5] [6]
Figure 1

FIGURE 2
Design strategy for foam insulation [4]
Figure 2

KEYWORDS
Biobased | Foaming agent | Ecomaterials | Insulation

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