

Stage Internship: Eco-responsible building materials

Keywords: circular economy, cellulose, nanocellulose, foam, insulation, raw earth, extrusion, plaster

Project context and introduction:

In France, the construction sector is responsible for more than 25% of greenhouse gas emissions, the majority of which are linked to the production of building materials. The sector is also responsible for 70% of national waste production, 80% of which is excavated inert waste such as earth, gravel and concrete. The extraction of sand and gravel in quarries also generates a large quantity of waste: **washing sludge** (FAC). Given the urgent need to tackle climate change, it is imperative that we make far-reaching changes to the way we use these resources.

The virtues of raw earth materials, known for thousands of years, and the fact that they are low-carbon and reversible, have given them a new lease of life in recent years. The combination of **raw earth** and **plant fibres** has been shown on numerous occasions to increase the mechanical strength, reduce the density and lower the thermal conductivity of these materials (compressed earth blocks, mortars, extruded earth, etc.). As for cellulose fibres, they constitute an abundant resource, since they can be derived from biomass (virgin fibres) or from recycling (**recycled fibres**).

DESICELL project:

The DESICELL project is a research project aimed at valorizing waste from (i) the construction industry: **washing sludge** (FAC, silt) and (ii) the paper industry: **recycled fibres**. The aim is to develop new environmentally-friendly materials for the building industry. This project is therefore part of a circular economy approach involving the recycling of waste as a raw material.

Internship description:

The intern will be asked to produce lightweight elements with low thermal conductivity based on FAC and fibres, to offer an alternative to conventional insulation materials such as mineral wools. These materials will be produced using an innovative extrusion process. Particular attention will be paid to the mechanical, acoustic, hygrothermal and fire-retardant characterisation of the 'foams' obtained.

In addition, the intern will be able to explore the production of bio- and geo-sourced finishing coatings based on FAC and nanocellulose. Research into the rheological, spreading, water retention and pulverulent properties of the coating will be characterised. Attention will be paid to the aesthetics of the final result (smooth/rough, with relief/patterns) in order to provide some design elements.

The internship will last 5-6 months. This internship will take place in the LGP2 laboratory in collaboration with the Grenoble School of Architecture (ENSAG).

Candidate profile:

The candidate must have expertise in the field of materials (geo and bio-sourced materials would be a plus), with knowledge of thermal, acoustic, mechanical and rheological characterisation. A good level of English is required. Motivation, the ability to work in a team and autonomy are important factors in the selection of the candidate.

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Application: Resume (CV) and letter of motivation. Application deadline: 31st October 2023.