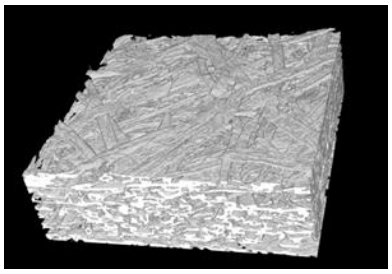
Postdoc Position

Microstructures and hygromechanics of novel molded ligno-cellulosic materials for sustainable, renewable, recyclable and biodegradable packaging

Project summary

Designing sustainable, renewable, recyclable and biodegradable materials for food, health or cosmetic packaging is of major importance but challenging. Wet or dry molding of ligno-cellulosic fibers are amongst the most attractive solutions to create affordable packaging with 3D complex shapes. Many research efforts are being developed purposely, in particular by looking for improved forming processes. They are needed both to minimize the environmental impact but also to create improved quality and durable packaging for long shelf life products.



3D image (X-ray tomography) of the microstructure of a typical molded ligno-cellulosic material made of wood fibers.

Up to date, however, the geometrical, mechanical and physical properties of most molded ligno-cellulosic objects are not sufficiently described and understood to create by design packaging fulfilling the end-use requirements.

To overcome this limitation and to address the requirements of one of the most demanding end-use sector, **L'Oréal and 3SR Lab are looking for a good candidate to properly characterize the performance and the durability of new cellulosic fiber based packaging materials, *i.e.*, by linking their fibrous microstructures with their complex hygro-mechanical properties.** For that purpose, various experimental analyses will be carried out on molded ligno-cellulosic materials and 3D packaging developed by L'Oréal and its partners:

- The microstructures of these materials will be analyzed using 3D imaging at high spatial resolution, by using X-Ray microtomography and dedicated image analysis procedure to extract from the 3D images relevant microstructural descriptors (see figure).
- The sorption properties of molded samples will be characterized using a dedicated setup and proper sorption cycling.
- The hygro-mechanical properties of molded sampled will be analyzed using a specific tensile loading setup under controlled environment (temperature, relative humidity) and by using kinematical field measurements using Stereo Digital Image correlation (SDIC).

Work context and practical aspects

- **Context:** The proposed offer is part of a collaborative research project between L'Oréal Packaging Science Center and one academic partner from CNRS and Univ. Grenoble Alpes, *i.e.*, 3SR lab. The selected candidate will be part of a research team consisting of five senior researchers from L'Oréal and 3SR Lab, experts in the fields of ligno-cellulosic materials science, packaging, mechanics of materials and 3D imaging.
- **Location:** the postdoc project will be mainly located at 3SR Lab, a solids mechanics research lab of the CNRS and the Univ. Grenoble Alpes (Grenoble, France, https://3sr.univ-grenoble-alpes.fr/), with strong interactions with L'Oréal Packaging Science Center (Clichy and Aulnay sous Bois, France, https://www.loreal.com/fr/) .
- **Duration and starting date:** 12 months, May/June/July 2024
- **Salary:** around 2800€/month

Skills & Applications

- **Requested degree**: PhD in mechanics of materials or materials science, with a good background on bio-based systems
- **Keywords**: Bio-based materials, experimental mechanics, 3D imaging for heterogeneous and/or fibrous and/or cellular materials
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