

## Master 2 Internship (6 months)

### Bio-based Monomers synthesis and their polymerization in dispersed media: Towards fully bio-based sunscreen wood coatings

The reduction in the consumption of fossil fuels is one of the greatest social and economical challenges of the modern era. In order to reduce our dependence to fossil fuel and for long-term sustainability, biosourced alternatives have to be found to synthesize polymers.

One of the main resource for renewable materials has been fruits and wood waste. In this sense, terpenes, which are extracted from coniferous trees and citric fruits, are a category of biomass that can be exploited. Terpenes contain one or more unsaturated carbons and are commonly utilized in fragrance and flavors formulations (e.g. limonene, camphor). Although, attempts to form polymers by direct polymerization of terpenes have been reported,<sup>1</sup> the use of terpenes as monomers implies the incorporation of suitable functional groups to (co)polymerize them by free radical polymerization obtaining high yields.<sup>2,3,4</sup>

Recently, the group of Prof. Billon has reported the copolymerization of a wide variety of terpenoid-based (meth)acrylate monomers using readily environmentally friendly scalable processes in dispersed media.<sup>2-4</sup> These latexes can be used for wood protection but need to be formulated with bio-based UV blockers. A recent study in the group demonstrated the efficiency of the addition of lignin as UV blocking agent.

In this framework, the general objective of the proposed project is to synthesize lignin and terpenoid-based (meth)acrylate monomers and to copolymerize them to fully achieve bio-based sunscreen wood coatings.

Techniques: Organic chemistry, Polymerization in dispersed media, NMR, DSC, DLS, SEM, UV-Visible spectroscopy

**Period:** from mid-January to mid-July

**Supervisors:** Prof. Laurent BILLON (IPREM) & Gilles LABAT (FCBA)

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<sup>1</sup> Satoh, K.; Sugiyama, H.; Kamigaito, M., *Green Chem.* **2006**, *8*, 878.

<sup>2</sup> Noppalit, S., Simula, A., Billon, L., Asua, J.M. *Polym. Chem.* **2020**, *11*, 1151.

<sup>3</sup> Noppalit, S., Simula, A., Billon, L., Asua, J.M. *ACS Sustain. Chem. Eng.* **2019**, *7*, 17990.

<sup>4</sup> Noppalit, S., Simula, A., Ballard, N., Callies, X., Asua, J.M., Billon, L. *Biomacromolecules*, **2019**, *20*, 2241.