

Master 2 Internship

Synthesis and cationic ring-opening polymerization of fully renewable Cyrene™-derived monomers

URD Agro-Biotechnologies Industrielles (ABI) – AgroParisTech
CEBB - 3 Rue des Rouges-Terres, 51110 Pomacle

Host Laboratory: Located at the heart of the Pomacle-Bazancourt biorefinery, URD ABI AgroParisTech is a research and development unit of AgroParisTech dedicated to valorization of agrosources and biorefinery byproducts. With expertise in white biotechnologies, green chemistry, and process engineering, the team works on multi-disciplinary research projects aiming at the development of new industrial processes allowing integrating the transformation of byproducts of agriculture into high value-added chemicals such as polymers, fine chemicals, functional additives or cosmetics.

Work context and objectives: The application of green chemistry principles to polymer synthesis is crucial not only to solve environmental and waste management issues related to production processes, but also to transform biomass wastes into new sustainable high-performance materials. Currently, the vast majority of commodity polymers still rely on cheaper but non-renewable fossil feedstocks. To overcome the limited availability of petrochemicals, biomass feedstocks (e.g. lignin, cellulose, terpenes) can be used as abundant and renewable resources to produce chemical building blocks. Levoglucosenone (LGO) and its reduced counterpart Cyrene™ are commercial and renewable chiral molecules that can be obtained on a ton/year scale from cellulose, the main constituent of plant fibers and the most abundant organic compound on earth. The great versatility of LGO in diverse synthetic processes, such as polymer syntheses (e.g. polyacrylates, polyacetals, polycyclic olefins, polyesters, polycarbonates and polyvinyl-ether lactone), has been recently highlighted (mainly by URD ABI). In this context, we have decided to go extra miles and develop several compounds from the reaction of Cyrene™ with various lignin-derived molecules on the mg scale (unpublished results). These compounds have the potential to be used as monomers to give new and different functional polymers by cationic ring-opening polymerization (cROP). Based on these previous results and considering our strong expertise in LGO chemistry, the objectives of the internship are:

- Synthesis of new family of Cyrene™-derived monomers on a g scale.
- Polymerization of the targeted monomers by cROP to produce 100% renewable polymers
- Characterization of all polymers by different analytical techniques including NMR, TGA, DSC, SEC and FT-IR

Candidate profile: The candidate should be a master-level student with excellent skills in organic synthesis. Knowledge in polymer chemistry is desirable but not mandatory. She/he should have good analytical skills. High self-motivation and a hard-work attitude are appreciated. The internship will start as early as February 2023 for up to 6 months.

Contact :

Dr. German GIRI, german.giri@agroparistech.fr

Dr. Sami FADLALLAH, sami.fadlallah@agroparistech.fr