Investigation of new routes towards biobased polymers using underutilized forestry products

Function	Name	Email address
Supervisor	Arne Stamm	astamm@kth.se
Supervisor	Wissam Farhat	wisfa@kth.se
Examiner	Per-Olof Syrén	per-olof.syren@biotech.kth.se

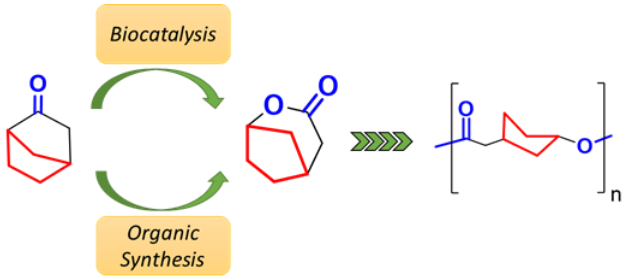
Background

Polymers play an essential role in everyday life from materials in automotive, packaging and electronics to compounds in medicine. Nevertheless, the finite supply of fossil fuels which are needed for most synthetic polymers leads to an increased need for the development of new materials from renewable sources. The use of renewable natural products from forestry, especially terpenes, offers a highly versatile platform for green building blocks. Abundant natural terpenes found in forest biomass can be functionalized through organic chemistry to add functional groups for polymerization. These monomers can then be converted into sustainable biobased materials. One of such promising product-class are polyesters derived from biobased lactones. The formation and efficiency of the chemical Baeyer-Villiger transformation in generating the key lactone intermediates is yet to be explored.

Project description:

This project aims to combine organic monomer synthesis and polymer chemistry to develop new synthetic techniques for novel materials, contributing to a more sustainable society. In this project, different biobased monomers for the design of sustainable polymers will be evaluated. Herein, the intended research targets efficient routes to obtain bicyclic lactones. The project will include a short literature study on polymer synthesis from renewable monomers. The practical part of the project will be divided into two parts. Part one will be focusing on the optimization of the synthesis and purification of the desired monomers. Part two will assess the ring opening polymerization and the characterization of the designed polyesters. During the training, the candidate will perform thermal,

mechanical, and structural analyses. This project will combine state of the art experimental techniques and offers the chance to participate in a rapidly developing research field. It is worth to notice that newly explored polymers herein, will have the potential to augment the replacement of synthetic materials with bio-based alternatives in novel sustainable applications.



Showcase. Oxidation of sustainable bicyclic ketones by either organic or enzymatic routes produce interesting lactone intermediates that can be incorporated in the design of new and fascinating polymers.