

« Development of biodegradable polylactide-based copolymers »

Unité Catalyse et Chimie du Solide (UCCS)

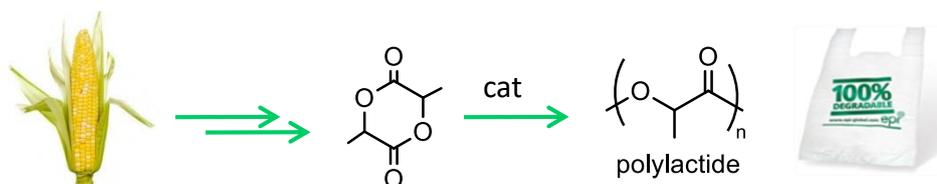
Unité Matériaux et Transformations (UMET)

Dr Philippe Zinck (UCCS) : philippe.zinck@univ-lille.fr

Dr Fanny Bonnet (UMET) : fanny.bonnet@univ-lille.fr

Duration : 4 months minimum

Among the different biobased materials available on the market, polylactide (PLA) is becoming more and more competitive and its production is growing. This biodegradable and biocompatible polyester is synthesized either by direct polycondensation of lactic acid, resulting from the fermentation of agrosources, or by Ring Opening Polymerization (ROP) of lactide, a cyclic ester derived from oligomerization-cyclization of lactic acid. ROP polymerization, which leads to the formation of PLA of high molar masses, requires the use of an initiator which initiates the opening of lactide and its polymerization. Among commercial lactides, L-lactide (L-LA), resulting from the cyclization of the L-isomer of lactic acid, is particularly interesting since it leads, regardless of the type of polymerization initiator used, to 100 % isotactic polylactide PLLA, semi-crystalline material ($T_m = 170\text{ °C}$) which displays mechanical properties close to those of polyethylene terephthalate (PET) and whose hydrolytic degradation is slower than that of amorphous polylactides. It has a glass transition temperature (T_g) of about 60 °C which gives it a high modulus of elasticity (3-4 GPa) and a low elongation at break (2-6 %) at room temperature. However, its characteristics, and particularly its low T_g , often make it unsuitable as a substitute for plastics used for everyday-life products.



The objective of this project is to strengthen PLLA by copolymerizing L-LA with other cyclic esters in order to produce high added-value copolymers with well-defined microstructures. In order to design these specific copolymers, coordination-insertion polymerization involving new polymerization methodologies will be a key tool. The properties of the final materials will be evaluated (SEC, TGA, DSC...).

The candidate must have knowledge in polymerization catalysis and polymer chemistry. In order to apply, please send a CV and a letter of motivation to Dr Philippe Zinck or Dr Fanny Bonnet.