PhD offer: Co-continuous nanocellulose polymer composites through selectively catalyzed surface initiated ring-opening polymerization

Job Description

Cellulose nanocrystals are ribbon-like highly anisotropic nanoparticles with cross sections ranging 4-20 nm and lengths 50 nm–microns that are extracted from native cellulose using inorganic acids. Their rigidity (up to 140 GPa) and anisotropy makes them excellent reinforcements for composite materials and as building block for porous materials. They have received an enormous amount of attention in the last decade and several industrial pilot plants with up to 1 ton/day production facilities have come online as a sign of industrial belief in these nanomaterials. While cellulose nanocrystals (CNCs) can be used as extracted, their use as reinforcement in polymers normally requires compatibilisation for better interfacial strength and the introduction of additional surface functionalities can make them excellent candidates as the structural as well as functional building blocks of for example (analytical) sensors, active and selective filters, 3D conducting networks with controlled anisotropy, and environmental trigger indicators. This can be done by surface-initiated polymerizations to selectively grow polymers from the CNC surface. While there exist examples of such work in the literature there are several important gaps that still exist in the state of the art for surface-initiated ring opening polymerization that limit the level of control.

The objective of this PhD project is to address the existing gaps in the current state of the art on ring-opening polymerization from cellulose nanocrystals by developing more selective catalytic systems for polyester grafting. Control over the level of grafting will be exemplified by optimizing the polymer-graft-CNC nanomaterials for co-continuous nanocomposite manufacturing, where the polymer graft forms the matrix phase and is the only polymer in the composite material.

Profile of the candidate

Suitable candidates should have a Master / Engineering degree in chemistry with background and experience in synthetic chemistry. Knowledge of ring-opening polymerization is a plus.

Starting date: October 2018.

Specific details: This PhD project is a joint doctorate between the Université de Lille and KU Leuven, Campus Kulak Kortrijk. The successful candidate will thus be registered as a student at both the Université de Lille and KU Leuven. The PhD candidate will mainly be working in the labs of Prof. Zinck in Lille, but will also spend significant time in the labs of Prof. Thielemans at the KU Leuven campus in Kortrijk.

How to apply : Send you resume, motivation letter with the name of one/two references to Prof. Philippe ZINCK (philippe.zinck@univ-lille.fr) and Prof. Wim THIELEMANS (wim.thielemans@kuleuven.be)