SUSTAINABLE MATERIALS LAB
DEPARTMENT OF CHEMICAL ENGINEERING @KULAK
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PhD position on Interfacial Stabilization of Water-Water Interfaces using Polysaccharide Nanoparticles for Tissue Engineering Applications

Sustainable Materials Lab
KU Leuven

4 Year fully funded PhD position, starting as soon as possible

Workplace

The Sustainable Materials Lab (SUSMAT) – Prof. Wim Thielemans, Department of Chemical Engineering, KU Leuven Campus Kulak Kortrijk, Kortrijk, Belgium

Work Environment

The PhD research work will be carried out within the SUSMAT group (Department of Chemical Engineering) of Prof. Wim Thielemans located on the Kulak Kortrijk campus of KU Leuven. The research group combines fundamental research with the development of applied materials from sustainable sources. The SUSMAT group is interdisciplinary and combines knowledge from a molecular level over processing and characterization of the materials.

The SUSMAT group has fully equipped wet chemical labs, elemental analysis, size exclusion chromatography (SEC), light scattering, small and wide-angle x-ray scattering (S/WAXS), x-ray photo-electron spectroscopy (XPS), dynamic scanning and isothermal titration calorimeter (DSC and ITC), and access to nuclear magnetic resonance (NMR) spectroscopy and electron microscopy facilities. Our research group at current consists of 11 PhD students, 5 postdoctoral researchers, a Research and an Industrial Research Fund Manager as well as a technician, and we also have numerous international scientific collaborations. More information on the group can be found through this link.

Topic

In collaboration with Prof. Carmen Bartic (Soft Matter and Biophysics) and Prof. Heidi Declercq (Department of Development and Regeneration), we received funding to develop 3D printable tissue engineering materials through nanoparticle-stabilization of phase-separating water-water multiphase systems. This PhD project will focus on understanding and manipulating the interfacial stabilization of phase-separated water-water systems using polysaccharide nanoparticles. Two other PhD students will be part of this project, one focusing on in-situ actuation of cell growth, and another on 3D bioprinting of multiphase materials. Together, we aim to create 3D bioprintable multiphase systems that can be used for tissue engineering or organ-on-a-chip applications.

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Objectives of the PhD project

This PhD project will investigate the potential of polysaccharide (cellulose and starch) nanocrystals to stabilize phase-separated water-water bijels. Polysaccharide nanocrystals with different surface chemistries will be synthesized and their assembly behavior at interfaces studied. Microscopy (optical and confocal), with SAXS and second harmonic microscopy used to look at particle assembly at the interface. Langmuir-Pockels throughs, oscillating drop, and interfacial rheology will be used to get a more fundamental insight into the interfacial behavior of the particles. The effect of salt, especially multivalent cations (for the anionic nanoparticles), will be investigated on the viscoelastic behavior of the particle-stabilized interfaces. Cations are known to regulate the interactions between the nanoparticles, affect their packing density, and control the porosity of the particle shell at the interface, and these effects will be studied to develop predictive models.

Profile of the candidate

We seek an enthusiastic researcher with a Master's in Chemistry/Chemical Engineering/Materials Science/Physics or related field with a proven experience in physical hydrogel structural and rheological characterization. Established knowledge of standard and advanced rheological characterization techniques as well as relevant chemical and physical characterization techniques (SAXS, DSC, optical polarized light microscope) is a plus.

Application details

Please send a CV, a cover letter and the contact information for 2 references to Wim Thielemans (wim.thielemans@kuleuven.be). You can also contact Wim Thielemans to request additional information or with any questions you may have.