

Virtual winter course of 2-days Cellulose Wet Spinning (5 ECTS)

short course organized by Aalto University and Technical University of Graz

Lecturer: Herbert Sixta

Course assignment examiner: Michael Hummel



We offer full course version for doctoral students:

5 ECTS – active lecture attendance and participation to group activities within these 2 days. Course code CHEM-LV02. We use Zoom for lectures, remember to install app. Apart from 10h of the lecture attendance the students who want to earn these credits must select an assignment and submit a final report. Submission deadline for the assignment report is 30 April 2022. We do not accept the course work submissions after April 30, 2022.

We offer lectures only choice for industry/company-based participants:

1 ECTS – active lecture attendance of 10 hours for two days and participation to group activities within these two days. We use Zoom for lectures.

Course enrolment is open until March 1st, 2022!

All participants enroll via webropol survey <https://link.webropol.com/S/4BCB70816FF091FB> also accessible with QR-code at top.

TU Graz students shall receive their course certificate from Aalto CHEM, and credits will be included later to their TU Graz register. If more questions, kindly correspond with Claudia Bäumel (claudia.baumel@tugraz.at)

Important: **Company participants** must also apply for non-graduate study right with us. Send nongraduate-form (link below) to **doctoral-chem (at) aalto.fi**

Attach form link here https://into.aalto.fi/download/attachments/12356772/506_nongraduate.pdf?version=1&modificationDate=1554122921951&api=v2 Please note that since all the teaching is virtual, you do not need to pass our safety course prior to attending this course.

Title	LV-Nr.	Content	Scheduled Dates
<u>Cellulose Wet Spinning</u>	Aalto University CHEM	<ul style="list-style-type: none">• Introduction, history• Pulps as raw materials<ul style="list-style-type: none">· Origin· Characterization· Methods for DP adjustment	March 10 th – 11 th 2022

		<ul style="list-style-type: none"> • Cellulose solvents <ul style="list-style-type: none"> · Direct cellulose solvents · Alkaline aqueous solutions with & without derivatization · Practical aspects of cellulose dissolution including the assessment of solution • Theoretical aspects of cellulose dissolution <ul style="list-style-type: none"> · Thermodynamics of polymer solutions (Flory-Huggins) · Solubility parameters · Molecular dynamics: NMMO/water/cellulose • Rheology of cellulose solutions <ul style="list-style-type: none"> · Fundamentals · Solutions with direct solvents · Aqueous solutions • Coagulation and regeneration of cellulose <ul style="list-style-type: none"> · Thermodynamics (phase behavior of polymer solutions) · Dry jet-wet spinning · Wet spinning with focus on viscose · Others • Filament breaches during spinning • Types of MMCFs • Properties of MMCFs <ul style="list-style-type: none"> · Mechanical properties · Optical properties, dyeability · Interaction with water • Open discussion: Students' questions and answers <p><u>Further information PP presentation of Cellulose Wet Spinning course</u></p>	<p><i>Days are fixed, detailed lecture hours total of 10h. Full day remote course with ZOOM</i></p>
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Lecturer: Univ.-Prof. Dr. Herbert SIXTA, A long term Head of Department of Bioproducts and Biosystems, Aalto University, Helsinki/Espoo, Finland



Prof. Sixta has more than 35 years of experience in industrial research on pulp and cellulose chemistry. The scope was extended to lignocellulosic biorefineries after his appointment as professor at Aalto University in 2007, where he until recently functioned as the Head of Department of Bioproducts and Biosystems comprising 24 tenured positions. His core interest comprises the use of tailored ionic liquids for the selective dissolution of different biopolymers as a novel way of biomass fractionation. In material science the focus is laid on the development of high added-value cellulose material regenerated from ionic liquid solution as well as the synthesis of building block chemicals by heterogeneously catalyzed conversion routes from polysaccharides. He has authored more than 250 peer-reviewed publications, several books and has been awarded several prizes for his work.

Professor Sixta's broad research interests include the following:

Pulping chemistry and technology with special emphasis on dissolving pulps | Cellulose chemistry | Chemistry of the fractionation of biomass, in particular lignocellulosic biomass | Valorization of cellulose to regenerated cellulose fibers and cellulose derivatives | Valorization of hemicelluloses as furanic compounds | Isolation, characterization and valorization of lignin | Chemical and mechanical purification of pulps | TCF- and ECF bleaching techniques | Organosolv fractionation methods with particular emphasis on GVL/water pulping of hardwood

Course assignments and reports: Univ. prof. Dr. Michael HUMMEL



Prof. Hummel joined Aalto University in 2009 as a postdoc where he developed a cellulose fibre spinning process using a superbase-based IL together with Prof. Sixta. After a postdoc year in 2014 at the Institute of Pharmacy, University of Innsbruck (Austria), where his work targeted new ionic liquids for pharmaceutical applications, Michael moved back to Aalto University to continue working on the IL-based fibre spinning process as Staff Scientist. He was appointed as professor in 2019 and is leading the Biopolymer Chemistry and Engineering research group which explores the structural features and thermochemical behavior of biopolymer solutions and suspensions to produce value-added products. Prof. Hummel's and his group's research areas are presented here

<https://www.aalto.fi/en/department-of-bioproducts-and-biosystems/biopolymer-chemistry-and-engineering>