





Title of the internship topic	CELLULOSE AEROGEL COMPOSITES: PRODUCTION, RESEARCH AND APPLICATION (Aerogel)
Field(s) of study, department, start date, duration	<p>Department: Faculty of Marine Technology and Natural Sciences</p> <p>Preliminary start of internship: 02.11.2023</p> <p>Duration of internship: 2 years</p>
Brief description of the research project and the results to be achieved (objective, keywords)	<p>In recent years, more and more attention has been paid to a new, promising, multi-functional material with unique physico-chemical properties – aerogel. Aerogel made from cellulose is biocompatibility and biodegradability, and has other advantages such as reusability, low density, high porosity, and surface area. Due to these properties, aerogels can be applied in adsorption, oil/water separation, wastewater treatment from dyes, thermal insulation, biomedicine, and other fields.</p> <p>In 2021-2022 we implemented the InoBioTech Baltija project, the result of which is a biotechnology developed up to 8 TRL and tested in the water area of the port. In the implementation of the project, we used straw with oil-degrading microorganisms. Instead of straw, a cellulose aerogel is to be used, which alone is effective as a sorbent for oil. After hydrophobic treatment, it is at least 5 times more efficient than straw. Therefore, with this project, we aim to develop a cellulose aerogel with such a component composition, on which oil-degrading microorganisms could be immobilized, and for this, additional additives that promote the growth of microorganisms are required.</p> <p>What additives can be used? How will the chemical, physical and biological properties of aerogels change? How will product performance change? These are the central questions dealt with in this project.</p> <p>The aim of the research is to develop the technological basis of the production of aerogel composites using cellulosic wastes and additives of biological origin and to evaluate the sorption capacity of spilled crude oil and its products.</p> <p>Tasks:</p> <ol style="list-style-type: none"> 1. To develop technological bases for the production of sustainable aerogels and to produce them. 2. To study the chemical, physical and mechanical properties of the produced aerogels. 3. To investigate the maximum sorption capacity of the aerogels for crude oil, marine diesel and lubricating oils and the sorption capacity on the water surface, as well as the possibility of reuse. <p>A detailed research plan will be developed with the postdoc at the start of the internship.</p>
Relevance of the topic to the goals and priorities of the strategic research direction	<p>The proposed topic corresponds to the priority "Resource-saving technologies based on circular economy principles" of the strategic direction of Klaipėda University "Towards sustainable technologies, blue and green growth and a healthy sea" (2020 06 18, Nr. 11-70) goal "Improving the quality of the marine environment and creating future technologies".</p> <p>The problem which we are solving have never been so actual for the human with arising awareness on climate change and health.</p> <p>Climate change is the biggest challenge of our times. With the Paris Agreement on climate change in force, the transition to a modern and low-</p>

	<p>carbon economy has to be accelerated. The European Green Deal set the blueprint for transformational change. All 27 EU Member States committed to turning the EU into the first climate neutral continent by 2050. To get there, they pledged to reduce emissions by at least 55% by 2030, compared to 1990 levels. This will create new opportunities for innovation and investment and jobs.</p> <p>The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future.</p> <p>Wastepaper based aerogel contributes to the following SDGs:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>3 GOOD HEALTH AND WELL-BEING</p> </div> <div style="text-align: center;">  <p>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</p> </div> <div style="text-align: center;">  <p>14 LIFE BELOW WATER</p> </div> <div style="text-align: center;">  <p>15 LIFE ON LAND</p> </div> </div> <p>We see our mission to contribute significantly to the efforts of modern society to save the future.</p>
Planned intermediate and final results (scientific outputs: publications, reports, etc.)	A minimum of 2 Clarivate Analytics Web of Science database publications in the Q1-Q2 quartile of citation rates are planned (one per year). The results of the research will be presented at international conferences.
Requirements for the trainee	<p>We are seeking a highly motivated candidate with a master's degree or equivalent qualification in ecology and environmental science, chemistry, environmental engineering, chemical engineering or a related field.</p> <p>Scientific experience and the ability to operate laboratory equipment (gas chromatograph, water quality measuring instruments, etc.) would be an advantage.</p>
Equipment of the topic (infrastructure, connection to ongoing projects)	<p>The main research work will be executed in the laboratories of the Faculty of Marine Technology and Natural Sciences (chromatographic analysis, sorption analysis, determination of physical parameters of aerogels, etc.) and in the laboratories of the Marine Research Institute (aerogel synthesis, microbiological analysis, mechanical properties etc.).</p> <p>Additional analysis (aerogel morphology, microbiology) if needed will be performed by other institutions, including EU-Conexus partners.</p>
Proposed supervisor of the internship	prof. dr. Tatjana Paulauskienė, tatjana.paulauskiene@ku.lt , tel. +370 681 48697
Experience of the supervisor with the proposed topic	<p>Paulauskiene, Tatjana; Uebe, Jochen; Kryzevicius, Zilvinas; Kaskova, Valeriia; Katarzyte, Marija; Overlingė, Donata. Removal of petroleum hydrocarbons from brackish water by natural and modified sorbents // Journal of marine science and engineering. Basel: MDPI. eISSN 2077-1312. 2022, vol. 10, iss. 5, art. no. 597, p. 1-17. DOI: 10.3390/jmse10050597.</p> <p>Paulauskiene, Tatjana; Teresiute, Audrone; Uebe, Jochen; Tadzijevs, Arturas. Sustainable cross-linkers for the synthesis of cellulose-based aerogels: research and application // Journal of marine science and engineering. Basel: MDPI. eISSN 2077-1312. 2022, vol. 10, iss. 4, art. no. 491, p. 1-14. DOI: 10.3390/jmse10040491.</p> <p>Paulauskiene, Tatjana; Uebe, Jochen; Ziogas, Mindaugas. Cellulose aerogel composites as oil sorbents and their regeneration // PeerJ. London: PeerJ. eISSN 2167-8359. 2021, [vol.] 9, art. no. e11795, p. 1-21. DOI:</p>

	<p>10.7717/peerj.11795.</p> <p>Uebe, Jochen; Paulauskienė, Tatjana; Boikovych, Krystyna. Cost-effective and recyclable aerogels from cellulose acetate for oil spills clean-up // Environmental science and pollution research. Heidelberg: Springer. ISSN 0944-1344. eISSN 1614-7499. 2021, vol. 28, iss. 27, p. 36551-36558. DOI: 10.1007/s11356-021-13369-9.</p> <p>Paulauskiene, Tatjana; Uebe, Jochen; Karasu, Ali Ugurcan; Anne, Olga. Investigation of cellulose-based aerogels for oil spill removal // Water, air & soil pollution. Cham: Springer. ISSN 0049-6979. eISSN 1573-2932. 2020, vol. 231, iss. 8, art. no. 424, p. 1-10. DOI: 10.1007/s11270-020-04799-1.</p>
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