

Klaipėda University strategic research directions
"Towards sustainable technologies, blue and green growth and a healthy sea"

Postdoctoral Fellowship Topic Application (2022-2024)

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| Title | Low-temperature gas plasma recycling of waste plastics into fuels |
| Research field(s) of the traineeship, host department, start date, duration | Technological sciences, Chemical engineering. The traineeship would take place in the Department of Engineering. Start 2023.01. Duration two years |
| Brief description of the research and the results to be obtained (aim and objectives, keywords) | <p>Recycling waste into value-added products is becoming increasingly important as the economy moves towards a circular model. Plastic waste, due to its chemical composition and energy value, can be a valuable raw material for the production of alternative fuels or solid residues such as coal. The pyrolysis process is a very promising recycling method that can produce valuable products: gas, liquid phase and solid residue. The use of plasma should have a positive effect on the reaction dynamics. The process should increase the yield of the liquid fraction, improve its properties and make it more compatible with fuel requirements.</p> <p>The objective of the project is to develop a technology for the recycling of plastic waste, the stabilization of the pyrolysis products and the extension of the downstream use of plasma.</p> <p>Objectives:</p> <ol style="list-style-type: none"> 1. Installation and development of equipment 2. Low-temperature pyrolysis of individual plastics or mixtures of plastics using gaseous plasma. 3. Investigation of the chemical and energetic properties of oil and solid residues. <p>Keywords: pyrolysis, low temperature, gas plasma, in situ treatment, plastic waste, valuable materials, alternative fuels)</p> |
| Relevance of the topic to the objectives and priorities of the strategic research thrust | The proposed research is in line with the sub-theme "Towards Sustainable Technologies, Blue and Green Growth and a Healthy Sea": "Resource-efficient technologies based on the circular economy". The research will develop a technology to produce alternative fuels using plastic waste. This will reduce the use of fossil fuels and the reuse of plastic waste will reduce the negative environmental impact of industry. |
| Planned intermediate and final results (scientific outputs: publications, reports, etc.) | 3 scientific publications will be produced and a conference will be attended. |
| Requirements for the trainee | A PhD, preferably in the natural sciences or technology. Preferably, the candidate should be able or willing to work in a laboratory and have experience in chemical or other research. It would be an advantage if the candidate has mastered modern analytical methods and has experience in evaluating and interpreting data using statistical analysis methods. The candidate should be able to summarise results in reports and present them both internally and at conferences. Experience in preparing manuscripts is required. Strong communication skills, a systematic working style, reliability, commitment and team spirit are desirable. Good oral and written English language skills are required. |
| Subject endowment (infrastructure, link to ongoing projects) | The candidate will join a team of chemists and chemical engineers with extensive experience in biomass and plastics pyrolysis and product analysis. The existing equipment (pyrolysis reactor, product analysis equipment, etc.) will be complemented by a gaseous plasma unit, which will ensure the trainee's employment. Support from the team in the field will help to ensure the success of the project. |
| Intended supervisor of the traineeship | Dr. Jochen Uebe (jochen.uebe@ku.lt); tel.: +370 684 08676 |

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| Manager's work on the proposed topic | <p>Dr. Jochen Uebe has extensive experience in research projects and the development of new technologies. He is currently working on the project InoBioTech Baltics (01.2.2-MITA-K-702-11). His idea was the basis for the development of a cavitator mock-up for INOVTECHNA. The project was funded by MITA. Jochen Uebe and his colleagues developed and patented 6 technologies in the field of nanoscale phyllosilicates for lithium-ion batteries and electrochemical capacitors, smart shock absorber fluids for cars and car headlight housings, in their previous work (at the M. Planck Institute for Polymer Research and the Fraunhofer Institute for Silicate Research, Germany). He also has extensive experience both in the field of renewable energies and in the commercialisation of scientific ideas. Pyrolysis technologies and their development for recycling both plastic waste and algae are a major scientific interest at the moment. In the last year, 10 articles have been prepared and published in journals referenced by Clarivative Analytics DB. The supervisor has extensive experience and expertise in the proposed topic.</p> |
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