

Klaipėda University Strategic Research Area

"Towards Sustainable Technologies, Blue and Green Growth and a Healthy Sea"

Postdoctoral Internship Topic Application (2025-2027)

Title of the internship topic	Production of higher value-added products from plastic waste
Field(s) of the internship, implementing unit, start, duration	Chemical engineering. The traineeship would take place in the Department of Engineering. Start 2025.10. Duration two years
Brief description of the research and the desired results (goal and objectives, keywords)	<p>Pyrolysis of plastic waste is a widely used thermochemical conversion process that produces large quantities of liquid products. The liquid phase has a high calorific value, close to that of fuel. However, the use of the liquid phase is limited by the low oxidative stability of the liquid phase. Various chemical and physical methods are used to improve the properties of the liquid phase. One such method is low-temperature plasma, as currently implemented in our group, but this is primarily suitable for the treatment of gases. To treat liquids such as oils or solids such as coal or carbon-containing plastic waste, the plasma generators must be modified.</p> <p>The use of low-temperature plasma to treat pyrolysis oil from plastic waste is a new and little-researched process that can utilize plasma in the liquid phase. After investigations, it was found that when pyrolysis oil was treated with plasma, a large amount of carbon was released during the process.</p> <p>Therefore, this postdoctoral fellowship aims to analyze the products of plasma treatment, both to specifically produce higher-quality oils and to produce high-quality coal-based products. In any case, an analysis of the resulting gas products is of interest, either to encourage their recycling into the plasma treatment process or to obtain high-quality products from them.</p> <p>The analysis of the gases, oils, and carbonaceous solids will be carried out using the existing analytical equipment of the Chemical Engineering Group and the Marine Research Institute. An analysis of energy consumption and material conversion will serve to evaluate the economic viability.</p> <p>Objectives:</p> <ul style="list-style-type: none"> - Development of a plasma pyrolysis plant with optimizations for carbon production and for the production of oils from pyrolysis oil from plastic waste - Testing of various plasma generator designs (microwave, discharge arc) for their respective optimization - Analysis of the chemical and physical properties of the resulting coal, gas, and oils - Economic viability assessment <p>Keywords: low-temperature plasma, slow pyrolysis, plastic waste, material flow analysis, coal production, economic viability assessment.</p>
Compliance of the topic with the goals and priorities of the strategic research direction	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 remove plastic waste and produce carbon, which has wide applications in the chemical industry or agriculture, improving soil and, possibly, obtaining valuable petrochemical products. This will reduce the negative impact of the industry on the environment and will allow the use of all products generated during the processes.

Planned intermediate and final results (scientific output: publications, reports, etc.)	3 scientific publications will be produced.
Requirements for the intern	<p>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. Experience in preparing manuscripts is required. Strong communication skills, a systematic working style, reliability, and commitment.</p> <p>Good oral and written English language skills are required.</p>
Topic provision (infrastructure, link with ongoing projects)	The Department of Engineering has its own pyrolysis reactor and plasma generation equipment. The candidate will join a team of chemists and chemical engineers with extensive experience in the pyrolysis and product analysis of biomass and plastics. The available equipment (pyrolysis reactor, product analysis equipment, gas plasma equipment, etc.) will ensure the intern's employment. The support of the on-site team will help ensure the successful implementation of the project.
Intended internship supervisor	Dr. Žilvinas Kryževičius (zilvinas.kryzevicius@ku.lt), tel.: +37068434462
Supervisor's experience in the proposed topic	Dr. Žilvinas Kryževičius has experience in research projects and the development of new technologies. He is currently working on the South Baltic Interreg-funded project ISMA and the project "Establishing a Centre of Excellence for Sustainable Coastal Development". He also has extensive experience in technologies: slow pyrolysis and low-temperature plasma, which are using in ongoing projects. Pyrolysis technologies and their improvement for biomass and recycling plastic waste and pyrolysis oil treatment with low-temperature plasma are currently of great scientific interest. In recent years, 9 articles have been authored and published in journals referenced by Clarivate Analytics Web of Science database. The supervisor has extensive experience and expertise in the proposed field.