Persistent Organic Pollutants from Pyrolysis of Plastics

Summary

Plastic pyrolysis, a process converting plastic waste into valuable chemicals and fuels, can generate persistent organic pollutants (POPs) such as dioxins, furans, and PAHs. These toxic and long-lasting chemicals pose significant environmental and health risks. Proposed research topic aims to identify and reduce the formation of POPs during pyrolysis by optimizing conditions and developing degradation methods. Advancing this knowledge is crucial for making plastic pyrolysis a safer and more sustainable waste management solution, protecting both environmental and public health

Research field:	Chemical, materials and energy technology
Supervisors:	Prof. Dr. Alar Konist Dr. Oliver Järvik
Availability:	This position is available.
Offered by:	School of Engineering Department of Energy Technology
Application deadline:	Applications are accepted between June 01, 2024 00:00 and June 30, 2024 23:59 (Europe/Zurich)

Description

Plastic pyrolysis, a thermal degradation process that converts plastic waste into valuable chemicals and fuels, is increasingly viewed as a promising solution to the global plastic pollution crisis. However, significant environmental concern associated with this process is the generation of persistent organic bpollutants (POPs). POPs are toxic, long-lasting chemicals that can accumulate in the environment and
pose severe health risks to humans and wildlife. During plastic pyrolysis, the complex polymer structures of plastics break down, potentially forming a range of POPs, including dioxins, furans, and polycyclic aromatic hydrocarbons (PAHs). These pollutants are known for their persistence, ability to bioaccumulate, and adverse effects such as endocrine disruption, cancer, and immune system impairment. Understanding the formation mechanisms and environmental impact of these pollutants is crucial for developing safer and more sustainable pyrolysis technologies.

Research in this area focuses on identifying and quantifying the types of POPs produced during pyrolysis, elucidating the conditions under which they form, and exploring methods to minimize their release. This includes optimizing pyrolysis conditions, developing catalytic systems to degrade POPs, and implementing effective pollution control measures. Ultimately, advancing our knowledge of POPs in plastic pyrolysis not
only enhances the sustainability of this waste management technology but also contributes to protecting environmental and public health.

Responsibilities and (foreseen) tasks

- Conduct comprehensive research on the formation, behavior, and fate of persistent organic pollutants during plastic pyrolysis.
- Develop and implement analytical methods for the detection and quantification of POPs.
- Collaborate with interdisciplinary teams to develop sustainable solutions for mitigating the release of POPs.
- Publish research findings in peer-reviewed journals and present at international conferences.
- Collaboration with other PhD students and colleagues in the department.
- Supervision of BSc and MSc students.

Applicants should fulfil the following requirements:

- A Master’s degree in Engineering, Environmental Science, Technology, Chemistry, Chemical Engineering, or a related field.
- Strong background in analytical chemistry.
- Experience with laboratory research and handling hazardous materials.
- Excellent written and verbal communication skills.
- Ability to work independently and as part of a multidisciplinary team.

The following experience is beneficial:

- Knowledge about the relevant legislation.
- Skills in different data analysis methods.
- The candidate must submit a conceptual research plan, including possible titles of at least three articles to be published on the project topic. The candidate can expand the listed research questions and tasks.

We offer:

- 4-year PhD position in the Department of Energy Technology in Tallinn University of Technology
- The chance to focus on a high-level research
- Opportunities for conference visits, research stays and networking
- In case of interest, the opportunity to participate in other project applications and projects

About the department
The Department of Energy Technology is a research-oriented department that has also strong connectionswith Estonian chemical industry and heat and power industry. The topics covered include chemical engineering, environmental engineering, thermal engineering, thermal powerplants, heat economy and thermal energy.
(Additional information)
For further information, please contact Professor Oliver Järvik oliver.jarvik@taltech.ee or Professor Alar Konist alar.konist@taltech.ee or visit https://taltech.ee/en/department-energy-technology

To get more information or to apply online, visit https://taltech.glowbase.com/positions/825 or scan the the code on the left with your smartphone.