Keemilise ja Bioloogilise Füüsika Instituut

National Institute of Chemical Physics and Biophysics

PhD position in "Depolymerization of textile wastes into valuable upcycled chemicals."

We are advertising a 4-year fully funded PhD position, starting in the second half of 2026. The position will deal with the ever-growing problem of increased use of single-use plastics and consumer fabrics. While around 80% of PET (polyethylene terephthalate) bottles are recycled in various countries[1] through mechanical recycling, the same cannot be said about other single use packages and polyester clothing and textiles that find their way to recycling (<20%).[1] Therefore, packaging and clothes make one of the largest problematic waste streams globally, with vast amounts of materials piling up in landfills. If this alternative resource could be upcycled into new raw materials, it would offer a transformative solution to one of the largest waste management industries, while also offering a new input material feed for the polymer industry.

Project summary:

To tackle this task, the candidate will work alongside analytical and organometallic chemists in the National Institute of Chemical Physics and Biophysics (KBFU/NICPB), in Tallinn, Estonia, with process chemists from TalTech (Tallinn, Estonia), and with two industry partners (including one of the largest chemical industries in the region). This project team will provide the candidate with access to needed research infrastructure, insight to consumer products upcycling and large-scale optimization of chemical processes.

Research Group:

The candidate will work in the organometallic chemistry research group (Dr Jakoobi) and in the advanced NMR research group (Dr Indrek Reile). He/she will develop catalysts for depolymerization processes, test the catalysts and support upscaling processes using these catalysts. The group is equipped with necessary infrastructure, including glove boxes, chemistry laboratory infrastructure and advanced characterization techniques. Proximity to an NMR research group will allow to familiarize with advanced NMR techniques to study catalysts, reactions and processes (including real time process monitoring). The candidate will learn catalyst development, organometallic chemistry, industrial chemistry, upscaling and relevant analytical techniques.

The candidate:

We are looking for an enthusiastic candidate that meets the following requirements:

1. Has finished his/her MSc studies or is finishing them in a month or two.
2. Has an undergraduate degree in chemistry, preferably in organic chemistry, polymer science, or material science, with passed courses in organic chemistry.
3. Is fluent in English and willing to learn Estonian to the level of A2 and potentially to B1 over the course of his/her PhD.
4. Should be able to interpret NMR spectra and perform basic structural elucidation.
5. Show curiosity to learn about the topic, processes, and engineering solutions, and characterization techniques. Enjoy working in an interdisciplinary environment and in collaboration with academic and industry partners.
6. Be willing to supervise BSc and MSc students during the PhD studies and take part in undergraduate workshops as assessor.
7. Previous industry experience in the field is seen as a bonus.

KBFI is a research-only institution and therefore the PhD candidate will be enrolled as a doctoral student nearby Taltech university, while conducting research activities in KBFI. The candidate will have access to lectures, courses and academic resources at the full Taltech PhD curriculum capacity. Funding will be available for 4 years from the start of contract. The contract will include 6 weeks of paid vacation annually.

Interested candidates should send their letter of motivation and CV to the email address PET-temta@kbfi.ee with the following title "PET-temta First Name Surname". Informal enquiries regarding the position should be directed to the same address.

References:

1) *Molecules* **2025**, *30*(2), 299