LITHUANIAN ENERGY INSTITUTE

ADMISSION TO PHD STUDIES FOR THE YEAR 2025

DOCTORAL RESEARCH TOPIC:

Application of the plasma methods to industry decarbonization by transitioning to sustainable and next-generation technologies

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

Revolutionizing Sustainable Fuel Production: Turning textile waste and greenhouse gases (CO2) Into Green Energy Solutions

The growing demand for consumer goods, combined with the rapid expansion of industries like fashion, comes at a steep environmental cost. Each year, the world generates approximately **92 million tonnes of textile waste**, a number that will skyrocket to **134 million tonnes by 2030**. This waste contributes significantly to pollution and CO2 emissions, an unsustainable trend that demands innovative solutions. The race to decarbonize industry and transition to sustainable energy is more critical than ever.

At the forefront of these efforts are visionary initiatives such as the **Lithuanian National Energy Independence Strategy, the REPowerEU plan, and the European Green Deal**, prioritizing cleaner energy, reduced greenhouse gas emissions, and new-generation sustainable technologies.

The Breakthrough: Plasma Technology for Waste Conversion and Cleaner Fuel Production

Advanced plasma technology is unlocking revolutionary possibilities for addressing these environmental challenges. From textile waste to industrial CO2 emissions, plasma-assisted processes provide a powerful solution to transform pollutants into valuable resources:

1. Textile Waste to Energy:
    - Plasma conversion processes transform non-recyclable textile waste into syngas – a versatile fuel that can produce hydrogen derivatives such as synthetic methane, methanol, and ammonia.
    - This reduces textile waste and decreases reliance on fossil fuels, significantly impacting energy source diversification and sustainability.
2. CO2 and CO Utilization:
    - Plasma-assisted hydrogenation processes help us reimagine the CO2/CO hydrogenation process. This method converts CO2 and CO emissions into clean fuels and chemicals under lower temperatures and pressures, making the process more energy-efficient and cost-effective.
    - Sustainable Impact: Instead of being pollutants, CO2 and CO emissions become raw materials for producing clean fuels and chemicals, contributing to industrial decarbonization and promoting a circular economy.

Leading the Charge Toward Sustainability

Scientific exploration into plasma conversion is unlocking new frontiers in energy recovery, waste management, and industrial decarbonization. Researchers aim to provide scalable, impactful solutions to reduce textile waste and greenhouse gas emissions by studying the optimal conditions for this process and evaluating its efficiency.

This innovative approach lowers the environmental footprint of fuel production, contributes to energy independence, and advances a circular economy.

Join us in leading the charge toward a cleaner, greener, and more sustainable future. Together, we can turn industrial waste and CO2 into a cornerstone of tomorrow's energy solutions.

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