LITHUANIAN ENERGY INSTITUTE

ADMISSION TO PHD STUDIES FOR THE YEAR 2024

DOCTORAL RESEARCH TOPIC:

Ammonia combustion enhancement by non-thermal plasma technology for clean and efficient energy production

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

The Paris Agreement implies reducing GHG emissions by around 45% by 2030. To achieve this, one of the strategic objective is to decarbonize heating, transport and industry sectors. For this reason, NH3 is suitable to replace fossil fuels in various combustion applications like gas turbines, gas burners and etc. for energy production. Despite that, the combustion of ammonia is complicated due to the high content of N2 and comparably very low flame speed resulting in the high NOx emissions, low combustion efficiency and flame instability.

Therefore, the use of plasma technology for ammonia combustion enhancement could be one of possible solutions to ensure stable and clean combustion process. Plasma assistance has been widely investigated on combustion enhancement of fossil fuels. The obtained results showed that plasma-assisted combustion leads to improved flame stability, extended flammability, reduced CO emissions and in some cases reduced NOx concentrations.

The aim of the work is the investigation of ammonia combustion enhancement by non-thermal plasma to improve flame stability and ensure clean and efficient energy production.

Tasks of the work: 1) to determine the influence of plasma assistance on ammonia combustion using flame spectroscopy, FTIR and gas chromatography methods; 2) to find the parameters for the plasma and burner leading to the efficient ammonia combustion; 3) to determine tendency/correlation of plasma influence on formed emitters in flames with combustion products and thermal flame characteristics.

The experiments will allow to determine the effect of non-thermal plasma on the combustion process of ammonia based on the established flame characteristics, the dependence of formation of initial, intermediate and post combustion products, depending on combustion conditions, plasma parameters and burner configuration.

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