



DOCTORAL RESEARCH TOPIC:

Investigation of plasma waste treatment processes recycling different types of waste into valuable composite materials and gases

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

The increasing population and fast-growing industry lead to an even greater consumption of resources and an increasing amount of various wastes. The utilization of waste, processing, secondary use, and implementing various management strategies are becoming increasingly important tasks for modern society. Thermal treatment and gasification are some of the most innovative technologies for decomposing harmful waste. However, there are groups of waste when treatment using traditional methods is harmful to the environment and human health. In order to fully break down the hazardous compounds containing waste, the ambient temperature should be raised above 1300 oC, and the material should be kept there for 3 – 4 seconds. In such cases, it is necessary to implement plasma technologies in the industry, where the molecules of the treated waste are split into atoms, radicals, electrons and positive ions. As the plasma cools, simple, non-toxic substances are formed. More features of the plasma waste treatment technology of various materials can be mentioned, such as extremely high process temperature, short reaction time, high activation energy, the ability to change various gases, neutralization of 99.99% of dangerous substances, independence from fuel sources, the possibility of extracting valuable solid materials and synthetic gas suitable for secondary use and no pollutants are formed during the waste decomposition process. Therefore, plasma technology is considered an advanced and promising way of waste management, but there is a lack of fundamental studies on the effect of the plasma flow characteristics on the waste treatment processes obtaining useful and valuable products for future applications.

The object of the research is the atmospheric pressure plasma application for waste treatment and conversion.

The aim of the research is to study the decomposition processes of selected wastes in atmospheric pressure plasma environment, determining the optimal conditions of the conversion process and analyzing the regularities of the processes.

SCIENTIFIC SUPERVISOR:

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