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THE STUDY ON PULSED ELECTRON BEAM ENERGY DISSIPATION IN GAS COMPOSITIONS OF INCREASED PRESSURE IN THE PRESENCE OF A CONDENSED PHASE (WATER, ASH)*

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The urgency of the project is justified by serious environmental problems of the environment (cleaning of flue gases) both in Russia and abroad. Electronic continuous accelerators (Indianapolis, USA and Karlsruhe, Germany) are currently used to purify flue gases. The initiation of plasma-chemical processes by a pulsed electron beam is one of the actively developing methods of activating chemical processes. The use of pulsed electron beams ensures the formation of plasma with a high degree of nonequilibrium in the ion and electron temperatures, which causes a number of advantageous features of this process when used in various industrial processes. The transfer of industrial processes to a new level of energy and resource efficiency is a modern trend with scientific and economic validity. Reduction of unproductive energy losses for heating nodes, aggregates, binders by combining reaction and plasma volumes will lead to higher productivity and economic efficiency of production. The use of nonequilibrium, fast-flowing processes in plasma will significantly increase the speed of chemical processes, and, therefore, reduce costs.

However, one of the important factors restraining the development of flue gas cleaning with the use of pulsed electron accelerators is the lack of an adequate physical model based on experimental data of the processes occurring during the interaction of pulsed electron beams, not only with model objects in the condensed and gas phase, but also with objects with a complex chemical composition, which are basic in technological processes. The complexity of the development of physical models is complicated by the nonlinear nature of the processes of energy absorption carried by beams, the formation of charged and excited particles, chemical reactions in the interaction zone, secondary radiation, and a number of other phenomena accompanying the interaction of pulsed energy flows with matter in the condensed and gas phases. A significant role in solving this problem is assigned to experimental research, experimental data both from the point of view of providing results for the formation of a model and its testing, and from the point of view of a quantitative description of the processes accompanying the development of specific technological processes.

In this work, the process of energy dissipation of a pulsed electron beam in gas compositions in the presence of a condensed phase will be investigated. The main components of flue gases (N_2, CO_2, O_2) were chosen as gas compositions. Water, ash were chosen as a condensed phase. These substances are either components of flue gases, or initial reagents or products of plasma-chemical reactions of the purification process using pulsed electron beams.

The TEA-500 accelerator and a drift volume were used in studies of the process of propagation of pulsed electron beams in gas compositions of increased pressure in the presence of a condensed phase (water, ash). The help of reverse current shunts, the reverse current and the current of the electron beam reaching the end flange of the drift tube determined.

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