



RESEARCH OF HEAT RELEASING ELEMENT OF AN ACTIVE ZONE OF GASEOUS NUCLEAR REACTOR WITH PUMPED THROUGH NUCLEAR FUEL - URANIUM HEXAFLUORIDE (UF₆)

G. Batyrbekov, E. Batyrbekov, E. Belyakova, S. Kunakov, S. Koltyshev

Institute of Atomic Energy of National Nuclear Center of Republic Kazakstan.

The previous and present activity sphere of the authors and executors of the project are connected to researches of physics and safety thermal emission space nuclear power installation, nuclear rocket engine, power nuclear reactors of nuclear stations.

The purpose of the offered project is learning physics and substantiation of possibility of creation gaseous nuclear reactor with pumped through nuclear fuel-hexafluoride of uranium (UF₆).

The urgency of a problem is connected with raising requests of society to safety of power nuclear reactors of atomic power stations. Creation of gaseous nuclear reactor pumped by nuclear fuel, in which products of division of uranium are permanently deleted from the outline and combustion of uranium by addition of hexafluoride of uranium is compensated, will allow to supply limiting safety of nuclear - power installation.

It is stipulated by the following possibilities of such reactor:

- By providing negative reactivity coefficient on temperature, power, phase transformation etc.;
- By providing of a minimum safe stock reactivity, necessary for automatic control;
- By exception of accumulation of products of division of uranium in an active zone, that will extreme reduce radiation danger of reactor for any of any decontamination of an active zone or fuel outline.

Main problems of this work are: Determination of physic-chemical, spectral and optical properties of non-equilibrium nuclear - excited plasma of hexafluoride of uranium and its mixtures with other gases.

Research of gas dynamics of laminar, non-mixing two-layer current of gases of hexafluoride of uranium and helium at availability and absence of internal energy release in hexafluoride of uranium with the purpose to determinate a possibility of isolation of hexafluoride of uranium from walls by inert helium. Creation and research of gaseous heat releasing element with pumped through fuel UF₆ in an active zone of research nuclear WWR-K reactor.

Objects of a research: Non-equilibrium nuclear - excited plasma of hexafluoride of uranium and its mixtures with other gases. With use of specially created ampoules will come true in-reactor probe and spectral diagnostics of plasma. Calculations of kinetics with the account of main elementary processes proceeding in it, will be carried out. Two-layer non-mixed streams of hexafluoride of uranium and helium at availability and absence of internal energy release. Conditions of obtaining and characteristics of such streams will be investigated.

Gaseous heat releasing element with pumped through fuel - UF₆ in an active zone of nuclear WWR-K reactor.

Fulfillment of the project will allow:

- To solve the problem on possibility of creation of extreme safe gaseous power nuclear reactor.
- To define physic-chemical and spectral properties of hexafluoride of uranium and its mixtures;
- To define the relation of energy transfer on different channels from gaseous active zone (radiation, heat transfer, mass transfer);
- To define a possibility of creation of a source of coherent and incoherent optical irradiation in a gaseous active zone with UF₆;
- To define a possibility of creation and condition of providing of two-layer non-mixing current of gases at availability and absence of internal energy release in hexafluoride of uranium, possibility of isolation of hexafluoride of uranium from walls by inert gas - helium;
- To develop the offers on methods of removal of energy, construction of heat releasing element and active zone;