Project № 3 MES of the RK

Theme of program: «Процессы самораспространяющегося высокотемпературного синтеза с участием металлических нанопорошков, активированных электронным излучением»

Project Manager – Ass.professor Dilmukhambetov E.E.

The amount of funding for 2017y. – 4 116 760 tenge.

Involved in research projects: Ukibayev Zh.K.

Main results: it was established that the effect of electron irradiation on nanopowders and contributes to an increase in the internal energy of crystal lattices, which is manifested in an increase in interplanar distances and heat of combustion; proposed an electrostatic model of the increase in the internal energy of nanopowders as a result of the ionizing effect of electron irradiation on metal atoms; the effect of reducing the temperature of spontaneous combustion of oxides of silicon, iron, titanium in alumina oxide systems in the presence of aluminum nanopowder has been established; The nanopowders of aluminum, iron, copper, and nickel that are not activated by irradiation intensify the alumino-combustion process of silicon oxide to varying degrees, which is manifested in an increase in temperature and rate of combustion in the SHS mode aluminum nanopowders subjected to electron irradiation, as an additive in aluminum-metal oxide exothermic systems, effectively initiate the SHS process with elevated temperature and velocity characteristics, up to explosive nature; The indices of the refractoriness of the SHS products in oxide systems — 1350 ° C for the aluminum – iron oxide system, 1580 ° C for the system aluminum - silicon oxide, 1850 ° C for the system aluminum - titanium oxide; It is shown that the SHS products in the aluminum-iron oxide, aluminum-silicon oxide systems do not have metal resistance with respect to liquid aluminum and duralumin at 900 ° C; SHS products in the aluminum-titanium system have relative metal resistance; It is shown that SHS products in aluminum-metal oxide systems have low corrosion resistance with respect to acid and alkali solutions.

The results of the work can have practical applications for creating highly efficient composite solid fuels, for designing thermochemical gas generators for treating the bottomhole zone of oil wells, for producing metal composite and refractory materials. In addition to the three projects for grant financing of the MES RK, the department carries out: