CABARET-COMBUSTION code validation on combustion experiments of different scale

Gavrikov A I[1,2,@], Glotov V Yu[1], Danilin A V[1], Kanaev A A[1] and Kiselev A E[1]

[1] Nuclear Safety Institute of the Russia Academy of Sciences, Bolshaya Tulskaya Street 52, Moscow 115191, Russia
[2] Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow 125412, Russia

[@] gavrikovandrey@yandex.ru

Hydrogen energy appears to be a promising alternative direction for the development of the fuel and energy complex of Russia due to the environmental friendliness of the fuel used and the product of the oxidation reaction in the air, which is the basis of energy production, the high heat released during this reaction, and the wide distribution of this chemical element. The purpose of this work is to verify the CABARET-COMBUSTION code, based on the numerical vortex-resolving method CABARET and intended for calculating turbulent combustion of mixed homogeneous and inhomogeneous hydrogen-air mixtures. Experimental data obtained in a series of experiments on the combustion of homogeneous hydrogen-air mixtures with different hydrogen contents at experimental facilities of different scale are used as database for verification. This work is a continuation of the verification of a series of computational codes based on the CABARET numerical method. Earlier, the verification of the CABARET-SC1 code based on this technique was carried out in on experiments on the propagation of jets in gaseous media. A description of the mathematical models implemented in the CABARET-COMBUSTION code is presented, and the results of the code validation are given, characterizing its capabilities in terms of the propagation of a turbulent flame. It is shown that in order to refine the results of calculations in lean hydrogen-air mixtures, it is necessary to include models of radiant heat transfer and heat loss on the walls of the facility.