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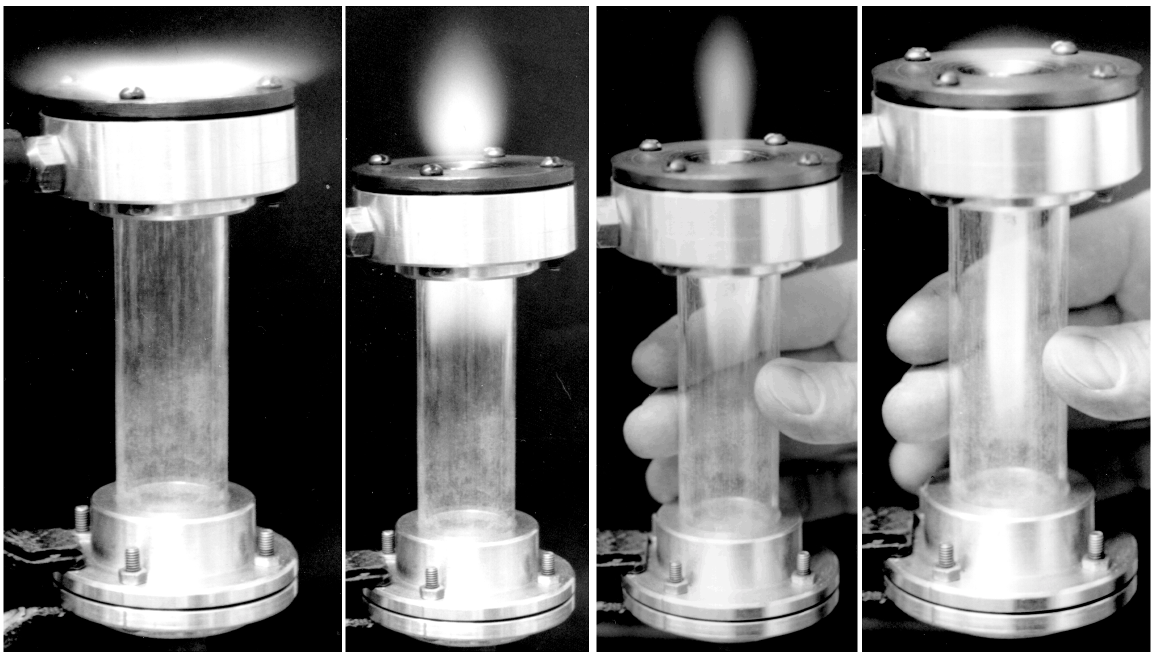
The applicability of the method of the Reverse-Vortex Stabilization (RVS), recently invented for plasma and other high-temperature zones insulation [1], was tested for the case of gaseous non-premixed flame (propane-butane + air) using a model combustion chamber. The scheme of the chamber was similar to some extent to the scheme of usual cyclone dust separator. This combustion chamber could be readily transformed into an ordinary swirl combustion chamber of the direct-flow type. Operation regimes of the laboratory scale combustion chamber with RVS are presented in Fig. 1.



a b c d

Fig. 1. The transformation of the flame in the combustion chamber with RVS with increase of the air-fuel ratio α*:* $\alpha \sim 0.6$ *(a, b); (c)* $\alpha \sim 1$*; (d)* $\alpha \sim 1.5$

RVS method ensures good flame stability: depending on fuel flow, the combustion was examined for air-fuel ratios between 5.4 and 35. RVS method was compared with the traditional Forward-Vortex Stabilization (FVS) approach from the standpoint of efficiency of hot flow generation. Calorimetric measurements were performed in nearly stoichiometry conditions to compare the energetic characteristics of two almost identical gas combustion chambers: one with FVS and one with RVS. Results of investigations show that the heat efficiency of the combustion chamber with traditional FVS is about 30% lower than that with RVS. The main advantage of RVS is the possibility to separate the flame from the walls of the device. In this case any problems of the wall material choice are eliminated, and the wall may be made from very thin and light material, that is especially important for aircrafts and rockets.

[1] Kalinnikov, V. T. and Gutsol, A. F., Physics - Doklady, Vol. 42, 179-181 (1997)