GAS COMBUSTION IN TWO-LAYERS CYLINDRICAL BURNER WITH HEAT RETURN BY RADIATIVE HEAT EXCHANGE *

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Combustion of gases in systems with heat recovery from the combustion products to the combustible mixture without their mixing is widely used in practical burner devices. Various schemes of burner devices with heat recovery are described in classical works [1-3] and others. The present work is devoted to theoretical estimates of the maximum achievable efficiency of radiation burners with filtration combustion of gas in a porous medium. The obtained theoretical estimates are compared with numerical calculations of the radiation efficiency of a cylindrical burner with two coaxial porous shells, between which the flame is stabilized (fig.1. a), and a single-layer porous burner with filtration combustion of combustion gas (fig. 1. b).

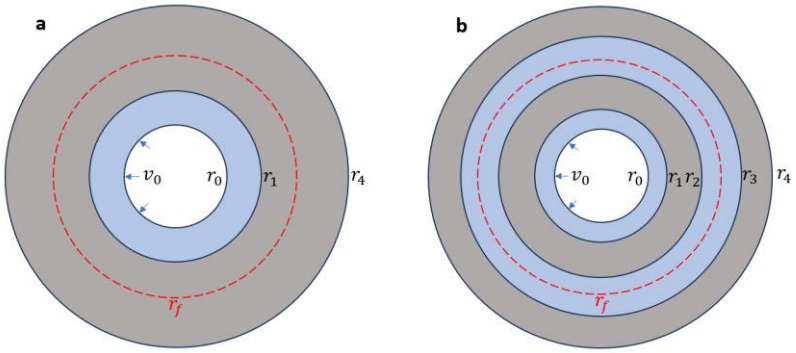

Fig.1. Two configurations of a cylindrical porous burner: a) single layer with filtrational combustion; b) double layer with combustion in a free space between two layers: r_0=0.3 cm, r_1=0.5 cm, r_2=1 cm, r_3=4 cm, r_4=5 cm.

It is shown (fig 2.) that although the radiation efficiency of the burners is approximately the same and does not depend on the method of heat regeneration. At the same time, the two-layer system has an advantage over the single-layer burner due to significantly lower hydraulic losses during gas filtration through it. In addition, the double-layer burner has a much shorter transition time to the combustion operation mode.

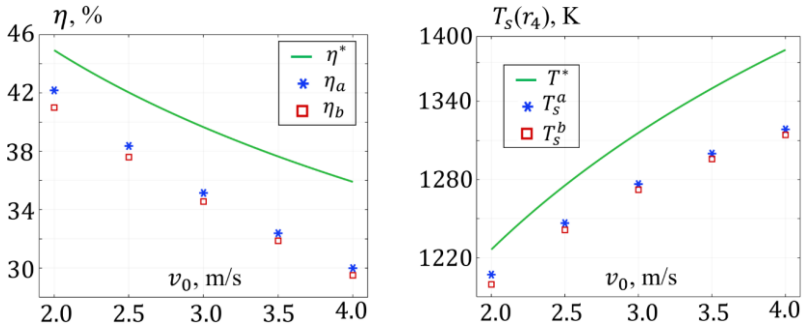

Fig.2. Outer surface temperature and efficiency of the single layer (T_s^a, η_a) and double layer burner (T_s^b,η_b) compared to the theoretical maximum possible temperature and efficiency (T^*, η^*) [4].

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