FORMATION OF NO DURING THE LOW-TEMPERATURE COMBUSTION OF H_2O/CH_4/AIR MIXTURES CONTAINING H_2O_2 OR O_3

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Abstract: The effect of H_2O_2 and O_3 on the ignition delay of the stoichiometric H_2O/Air/CH_4 mixture and on the formation of NO is studied. It is determined that the replacement of H_2O_2 by O_3 in the H_2O/Air/CH_4 mixture does not affect the NO yield. At the same time, according to the results of calculations, the yield of NO decreases at lower temperatures of the initial mixture (T_0). Thus, the value $T_0 = 650$ K can be achieved in the case of using the mixtures containing 0.01 mf of O_3. In this case, the NO concentration calculated at the combustion chamber outlet reaches values of 6–7 ppm. The results also assume that there is a possibility of further reduction in temperature of initial mixture and concentration of NO at the exit of the burner.

Keywords: H_2O_2; CH_4; O_3; ignition delay; combustion; NO

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Figure Captions

Figure 1 Dynamics of temperature changes (*1*) of H_2O/CH_4/air mixture containing O_3 (*a*) or H_2O_2 (*2*) (*b*) as well as the dynamics of CO (*3*) and NO (*4*) concentrations changes calculated using POLIMI mechanism ($i = 5$)

Figure 2 Comparison between the ignition delay ratios $(t_{\mathrm{GRI}})_{\mathrm{ign}}/(t_i)_{\mathrm{ign}}$ determined for the H_2O/CH_4/air mixtures containing H_2O_2 (*a*) and O_3 (*b*), calculated using the different mechanisms: *1* — $i = 1$; *2* — 2; *3* — 3; *4* — 4; and *5* — $i = 5$

Figure 3 Calculated ($i = 5$) dependencies of the concentration of NO_{plateau} upon the values of T_0 of methane–steam–air mixtures containing 0.01 ppm H_2O_2 (*1*) or O_3 (*2*)

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