EXPERIMENTAL AND THEORETICAL STUDIES OF THE METHANE OXIDATION PRODUCTS COMPOSITION IN THE MATRIX CONVERTERS

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Abstract: The calculation of the equilibrium distribution of reaction products for the system $CH_4 + 2\alpha O_2 \rightarrow$ Products at $0.25 < \alpha < 0.5$ and temperature 900–1473 K, where α is the oxidant-to-fuel equivalence ratio was performed. Based on the thermodynamic calculations at temperatures from 1000 to 1200 K, a substantial change in the yield of the reaction products was shown associated with the appearance of C_s ("s" stands for "solid") in this temperature range. Temperature limits were established for the domain where the transition to the equilibrium of the system with the synthesis gas formation accompanied by soot formation. Based on the experimental data on the H_2/CO ratio achieved in the matrix converter for different values of α, the formulae were derived that satisfactorily describe the oxidation products yield (per mole of methane converted). These formulae are useful for engineering design nd subsequent calculations based on macrokinetic models, as well as for the analysis of the effect of process parameters on the characteristics of the synthesis gas production in matrix converters.

Keywords: methane; synthesis gas; hydrogen; matrix conversion; soot formation

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