ENERGY GAIN AT PYROLYSIS AND COMBUSTION OF METHANE-ACETYLENE MIXTURES

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In the previous works [1, 2] the possibility of use of energy of carbon condensation at detonation decomposition of acetylene for development of environmentally friendly power set-up is considered. However acetylene is not natural fuel and its production demands additional power and economic expenses. Therefore studying of possibility of elaboration a united power cycle where the natural gas methane as initial fuel will be used is very actual, and the main energy release will occur not at the direct oxidation of methane, and at the allocation of energy of condensation of carbon and combustion of hydrogen which are formed at the thermal decomposition of methane.

In this work the energetics of the complex cycle including the partial oxidation of methane providing heating and conversion of a mixture to hydrogen and carbon vapor and the subsequent stages of process - a heat release at carbon condensation, separation of the condensed particles and hydrogen combustion are analyzed. The optimum regimes of such cycle providing the minimum yield of carbon dioxide and the maximum power efficiency of the subsequent processes of condensation and hydrogen combustion are determined. Comparison of absolute amount of the energy developed on 1 mole of fuel mixture at traditional combustion of methane-air mixture and at the proposed power cycle and also at detonation pyrolysis of acetylene is carried out. The quantity of a valuable industrial product - the carbon nanoparticles which are formed at generation of 1 MW of thermal energy is evaluated.

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