NON CATALYTIC METHANE FORMATION FROM SYNGAS IN THE DIELECTRIC BARRIER DISCHARGE PLASMA, INITIATED BY MICROSECUND PULSES

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From year to year the depletion of energy sources is becoming serious issue. Great attention is paid to the replacement of non-renewable energy resources. One of the examples of producing synthetic hydrocarbons is the Fischer –Tropsch process. However, Fisher-Tropsh process has some disadvantages: using of catalysts, high temperatures and pressure means use of expensive constructional materials. An alternative of the thermo-catalytic Fischer-Tropsch synthesis is a plasma-chemical synthesis of hydrocarbons. In this study, the principal possibility of methane formation from syngas (the mixture of hydrogen and carbon monoxide) in the dielectric barrier discharge plasma, initiated by microsecond pulses, was shown. Paper presents results of syngas treatment in the five-tube reactor under the influence of pulses with voltage amplitude of 12 kV and pulse repetition rate of 1000 1/s. It was found that reducing the volume flow rate of syngas increases the energy contribution, which positively influences the methane formation. Paper shows that the dependence of the volume fraction of the methane on the flow rate of initial gas mixture correlates with dependence of the energy contribution. Addition of nitrogen to the initial mixture in order to increase the concentration of reactive species in fact has a negative effect on the methane formation. Authors associated it with that the excited nitrogen reacts with carbon monoxide. This is a competitive process to the methane formation.

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