

SOOT FORMATION IN PYROLYSIS OF THE MIXTURES OF ACETYLENE WITH METHANE

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Work-In-Progress Abstract

Acetylene combustion and pyrolysis kinetics with accompanying soot formation is a discussion topic for decades. Proposed kinetic mechanisms were validated mostly on experimental studies of pure acetylene or acetylene/oxygen mixtures in different reactors. This molecule is a key intermediate specie in generally accepted HACA mechanism for soot formation in pyrolysis and combustion of hydrocarbons. Therefore the new experimental data obtained for the mixtures of acetylene with different hydrocarbons can clarify kinetic features of these processes. This work is devoted to experimental investigation of soot formation in the mixture of acetylene and methane. The experiments were carried out in standard shock tube reactor. The laser-induced incandescence (LII) for particle sizing and laser light extinction for soot volume fraction and induction period of condensed phase appearance measurements were used as in situ diagnostic tools. The unexpected dramatic increase of soot volume fraction (see Figure 1) as well as the slight reduction of induction times was observed with small amount of methane addition to acetylene pyrolysis.

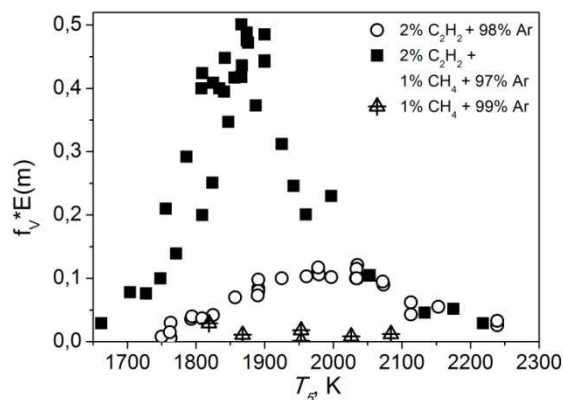


Fig.1. Temperature dependences of relative soot volume fraction obtained in acetylene/methane mixtures at reaction time of 950 μ s in shock tube reactor.

The Appel-Bockhorn-Frenklach gas-phase combustion mechanism and soot formation code of K.L. Revzan, N. J. Brown, and M. Frenklach, <http://www.me.berkeley.edu/soot/> was validated on obtained experimental data. The good qualitative agreement between experimental data and modeling results for the mixture of pure acetylene was found. The update of methane reactions part of the kinetic scheme is necessary for better quantitative description of experimental data for the mixtures of acetylene with methane.

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