

Experimental study of acetone influence on soot formation in shock wave pyrolysis of acetylene

Eremin A V[@] and Drakon A V

Joint Institute for High Temperatures of the Russian Academy of Sciences,
Izhorskaya 13 Bldg 2, Moscow 125412, Russia

[@] eremin@jiht.ru

The question of the influence of a small admixture of acetone contained in technical acetylene on the kinetics of its pyrolysis and the formation of soot during its self-decomposition and combustion is still a matter of debate. An experimental study of the effect of acetone impurity on the induction times and soot yield during the self-decomposition of acetylene behind shock waves was carried out in this work. The results of the experiments showed that an insignificant amount of acetone impurity (from 0.5 to 3.0 percent), characteristic of technical acetylene, does not significantly affect the kinetics of pyrolysis and the yield of soot. At the same time, the results of modeling using modern kinetic mechanisms, on the one hand, underestimate the rate of pure acetylene pyrolysis, and on the other hand, predict a considerable acceleration of pyrolysis and an increase in the yield of polyaromatic compounds and soot particles in acetylene in the presence of acetone additives. This result indicates the need for further improvement of kinetic schemes for a successful description of the processes of self-decomposition and soot formation in acetylene. The results obtained should be taken into account in the development of promising energy cycles using the energy of self-decomposition of acetylene, as well as in the analysis of the risks of spontaneous explosions in technological processes associated with the use of acetylene. This study was supported by RFBR-DFG project No. 20-58-12003.