# CHEMICAL IONIZATION BY OXIDATION OF $n$-HEXANE AND DIMETHYL KETONE IN REFLECTED SHOCK WAVES

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**Abstract:** Chemical ionization is the process of formation of charged particles as a result of energy release during the formation of a new chemical bond in chemical reactions between neutral components. Chemical ionization is most often observed in the processes of hydrocarbon combustion. Measurements of ionization current in internal combustion engines are of great practical interest. To understand the correlation of the type of ionization signal and the processes proceeding in the combustion chamber of the engine and to reduce the time and cost required for debugging electronic engine control systems, it is necessary to build detailed kinetic mechanisms of chemical ionization and to conduct detailed kinetic calculations with their help. Most experiments on chemical ionization were carried out in flames with obvious limitations: the composition of the mixture cannot be changed in an arbitrarily wide range of concentrations of fuel and oxidant, investigate pyrolysis processes, arbitrarily change the temperature and pressure, it is impossible to dispose of the transfer processes and gradients of temperature and reactive components. Experiments in shock tubes in the reflected shock waves are free from all the above disadvantages. In the present experiments, electric currents to electrically isolated and uninsulated cylindrical probes were recorded, to which a negative potential of $-9$ V was applied. From the processing of total current profiles to conducting probes, the concentration profiles of free electrons in a chemically reacting mixture of acetone and $n$-hexane with oxygen were determined. At the same time, two additional signals were simultaneously recorded: chemiluminescence signals of electronically excited $OH^*$ radicals ($\lambda_1 = 308$ nm) and radiation absorption signals at a wavelength of $\lambda_2 = 216$ nm by $CH_3$ radicals, which are precursors of CH radicals, directly involved in the chemical ionization of the formation of primary positive ions and free electrons: $CH + O = CHO^+ + e^-$. The main goal of the present work was to experimentally study the kinetics of chemical ionization during the oxidation of various mixtures of $n$-hexane and acetone with oxygen in reflected shock waves using a shock tube technique and to build a unified kinetic model of the chemical ionization process based on the experimental results obtained.

**Keywords:** ionization sensor; chemionization; thermionization; internal combustion engines; combustion process; kinetic model of chemionization; detailed kinetic modeling; reflected shock waves

**DOI:** 10.30826/CE19120403

## Acknowledgments

This work was performed within the framework of the Program of Fundamental Research of the Russian Academy of Sciences on the research issue of FRCCP RAS No. 47.16.

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*Received November 20, 2019*

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