KINETIC NATURE OF BLUE FLAMES OF ISOOCTANE SELF-IGNITION BY COMPRESSION

V. Ya. Basevich, A. A. Belyaev, F. S. Frolov, and S. M. Frolov

N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation

Abstract: A detailed kinetic mechanism of oxidation and combustion of isooctane was used for numerical simulation of blue flames which were observed at spontaneous ignition in compression-ignition engines. Satisfactory agreement between predicted and measured data on pressure, temperature, and time histories of main reaction products was obtained.

Keywords: isooctane; detailed kinetic mechanism; autoignition by compression; blue flames

Acknowledgments

The work was supported by the Russian Science Foundation (project No. 14-13-00082) and the Russian Foundation for Basic Research (grant 15-08-00782).

References

1. Downs, D., J. C. Street, and R. W. Wheeler. 1953. Cool flame formation in a motored engine. *Fuel* 32:279–295.
2. Sokolik, A. S. 1960. *Samovosplamenenie, plamya i detonatsiya v gazakh* [Autoignition, flame, and detonation in gases]. Moscow: AN SSSR Publs. 427 p.
3. Basevich, V. Ya., and V. I. Vedeneev. 1998. Kineticheskaya interpretatsiya mnogostadiynogo samovosplameneniya parafinovykh uglevodorodov [Kinetic interpretation of self-ignition of paraffin hydrocarbons]. *Khim. Fiz.* 17(5):73–80.
4. Basevich, V. Ya., A. A. Belyaev, V. S. Posvyanskii, and S. M. Frolov. 2014. Detal'nyy kineticheskiy mekhanizm mnogostadiynogo okisleniya izobutana [Detailed kinetic mechanism of multistage oxidation of isobutane]. *Goren. Vzryv (Mosk.) — Combustion and Explosion* 7:42–45.
5. Basevich, V. Ya., A. A. Belyaev, S. N. Medvedev, V. S. Posvyanskii, and S. M. Frolov. 2015. Detal'nyy kineticheskiy mekhanizm okisleniya i goreniya izopentana i isogeksana [Detailed kinetic mechanism of oxidation and combustion of isopentane and isohexane]. *Goren. Vzryv (Mosk.) — Combustion and Explosion* 8(1):12–20.
6. Detal'nyy kineticheskiy mekhanizm izooktana [Detailed kinetic mechanism of isooctane]. Available at: www.combex.ru (accessed December 18, 2015).
7. CHEMKIN-PRO Release 15083 (17.04.2009).

Received December 18, 2015

Contributors

Basevich Valentin Ya. (b. 1926) — Doctor of Science in technology, professor, chief research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; consultant, Noncommercial Partnership Center of Pulse Detonation Combustion; basevich@chph.ras.ru

Belyaev Andrey A. (b. 1954) — Candidate of Science in physics and mathematics, senior research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; specialist, Noncommercial Partnership Center of Pulse Detonation Combustion; belyaevIHF@yandex.ru

Frolov Fedor S. (b. 1981) — Candidate of Science in physics and mathematics, senior research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; senior specialist, Noncommercial Partnership Center of Pulse Detonation Combustion, 4 Kosygin Str., Moscow 119991, Russian Federation; f.frolov@chph.ru

Frolov Sergey M. (b. 1959) — Doctor of Science in physics and mathematics, head of department, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; scientific head, Noncommercial Partnership Center of Pulse Detonation Combustion, 4 Kosygin Str., Moscow 119991, Russian Federation; professor, National Research Nuclear University MEPhI, 31 Kashirskoe Sh., Moscow 115409, Russian Federation; smfrol@chph.ras.ru