Atomic resonance absorption spectroscopy study of reaction of propanol isomers with oxygen behind shock waves

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Propanol isomers (n-C_3H_7OH, i-C_3H_7OH) are promising applicants for the complete replacement of gasoline fuel. The main objective of this research was the experimental study of the interaction between isomers and oxygen at the high temperatures. The kinetics of reaction of biofuel with N_2O behind reflected shock waves is studied. The quantitative measurements of the time profiles of the concentration of oxygen atoms in the ground electronic state $O(^3P)$ were first carried out by the precisive method of atomic resonance absorption spectroscopy (ARAS) on a resonance vacuum-uv line of an oxygen atom at 130.5 nm. A study of the appearance and consumption of oxygen atoms during the reaction of propanol isomers with oxygen in mixtures 10 ppm N_2O + 1–10 ppm biofuel in Ar was performed. Along with the measurements, a detailed kinetic analysis was carried out using the Chemkin, consisting of a simulation of oxidation processes using current kinetic mechanisms and a corresponding sensitivity analysis of considered reactions. The data obtained in the course of a comprehensive study provide new valuable information on the features of the interaction of propanol isomers with oxygen at high temperatures, which will help both in verifying existing mechanisms and in creating new reliable kinetic schemes in a wide range of temperatures and pressures. The reported study was funded by the Russian Foundation for Basic Research (grant No. 20-58-12003).