Investigation of the high temperature kinetics of dimethoxymethane interaction with O_2 and N_2O

Kurbatova E.S.[1,@], **Bystrov N.S.**[1], **Emelianov A.V.**[1] **and Yatsenko P.I.**[1]

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

[@] kurbatova.lz@yandex.ru

Dimethoxymethane (DMM, methylal, $CH_3OCH_2OCH_3$) is the first representative of the polyoxymethylene dimethyl ethers (OME_n), which can be used as promising diesel fuel additives. Despite its high potential, there is some lack of data about DMM combustion, especially about concentrations of intermediates and oxidation at high temperatures. Hence, this work is aimed at comprehensive study of the kinetics of high temperature dimethoxymethane oxidation. An experimental part was carried out behind reflected shock waves on a high vacuum kinetic shock tube in highly argon diluted mixtures via the precise method of the atomic resonance absorption spectrometry (ARAS) in the vacuum-UV region of the spectrum at the resonant line of an oxygen atom at 130.5 nm. O_2 and N_2O were chosen as an oxidizing agents to study both molecular and atomic oxygen channels of primary interaction with the fuel. Overall experimental conditions implemented in this work are temperature range from 1800 to 3200 K, pressures 2-3 bar, mixtures of 10 ppm DMM + 10 ppm N_2O and 10 ppm DMM + 20 ppm O_2 in Ar. Time resolved absorption profiles of oxygen atoms obtained in the experiment, then, were modified into the corresponding concentration profiles. The collected data were used to validate current kinetic models. For this purpose, numerical modeling of experimental profiles was carried out in CHEMKIN software using the latest schemes. Calculated and experimental profiles show a good agreement for the mixture DMM + N_2O, meanwhile oxidation by O_2 are described with a great discrepancy between all models.