Emission of OH$^*$ and CO$_2^*$ during the high-temperature oxidation of acetone in reflected shock waves

Tereza A M$^1$,@, Smirnov V N$^1$, Vlasov P A$^{1,2}$, Shumova V V$^{1,3}$ and Garmash A A$^2$

$^1$ Semenov Institute of Chemical Physics of the Russian Academy of Sciences, Kosygina 4, Moscow 119991, Russia
$^2$ National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Kashirskoe Shosse 31, Moscow 115409, Russia
$^3$ Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow 125412, Russia

@ atereza@bk.ru

The autoignition of a stoichiometric acetone–oxygen mixture diluted with argon was studied behind reflected shock waves in the temperature range of 1350-1810 K at the total concentration of [M]$_{50}$~$10^{-5}$ mol/cm$^3$. Emission signals from electronically excited species OH$^*$ (at $\lambda = 308$ nm) and CO$_2^*$ (at $\lambda = 365$ and 451 nm) were recorded. It was found that the time profiles of OH$^*$ and CO$_2^*$ emissions reached their maxima almost simultaneously over the entire temperature range covered. It was revealed that, after reaching the maximum, CO$_2^*$ emission signals recorded at 451 and 365 nm behaved substantially differently. Numerical simulations of the OH$^*$ and CO$_2^*$ emission time profiles were carried out using blocks of reactions for the formation and quenching of OH$^*$ and CO$_2^*$ presented in the literature. The predictions of the numerical simulation performed turned out to be in close agreement with our own measurements and the results on acetone autoignition reported in the literature.