



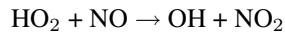
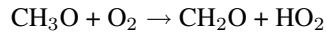
First *in situ* detection of HO₂ radical in a smog chamber by cw-CRDS

M. Djehiche (1), J. Tarmoul (1,2), A. Tomas (1), C. Fittschen (2), and P. Coddeville (1)

(1) Ecole des Mines de Douai, Douai, France (djehiche@ensm-douai.fr), (2) Physico-Chimie des Processus de Combustion et de l'Atmosphère, Université de Lille 1, Villeneuve d'Ascq, France

The hydroperoxyl radical HO₂ belongs to these trace species of the atmosphere which play a crucial role in the tropospheric chemistry. In particular, it is responsible for the formation of OH radicals through the HO₂ + NO reaction, the OH radical being the most important oxidant in the troposphere. The detection and quantification of the HO₂ radical during laboratory experiments in environmental chambers have been a challenge for a long time due to its short lifetime and consequently weak concentrations.

We have thus developed a new quartz photochemical reactor of 120 L which has been coupled to an *in-situ* cw-CRDS detector in the near IR. Preliminary tests on stable molecules like CO (~ 1570 nm) and CH₂O (~ 1510 nm) allowed us to determine the absorption sensitivity of the spectrometer. An α_{min} of 1×10^{-9} cm⁻¹ has been obtained, leading to an HO₂ detection limit of about 2×10^{10} molecule cm⁻³ at 6625 cm⁻¹. We then investigated the photolysis of methyl nitrite CH₃ONO at 365 nm:



For the first time, the HO₂ radical has been directly observed during the photolysis of CH₃ONO. Experiments have been conducted at 50 Torr total pressure and absolute HO₂ photostationary concentrations of $(0.8 - 1.5) \times 10^{11}$ molecules cm⁻³ have been determined, depending on the reaction conditions. The simultaneous measurements of the products (NO₂ and CH₂O) in the same wavelength region allow us to simulate the explicit chemical mechanism. The obtained results will be discussed and the perspectives in term of use of this new setup will be presented.