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# Brief overview of the heterogeneous chemistry of $N_2O_5$ and $NO_3$ free radical with flame soot from a lean and stoichiometric decane ($C_{10}H_{22}$) flame

F. Karagulian (1,2) and **M. J. Rossi (1)**

(1) Laboratoire de Pollution Atmosphérique et Sol (LPAS), Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland, (2) Now at the Department of Chemistry, UC Irvine, Irvine CA 92697-2025, USA (michel.rossi@epfl.ch)

Owing to the occurrence of both soot aerosol and $NO_y$ in plumes and wakes of automotive and aviation exhaust its heterogeneous chemistry may be of some atmospheric importance. Of all atmospheric aerosols soot occupies a special place because it strongly absorbs actinic radiation and is reactive owing to its reducing properties. Soot is therefore of some interest for climate change and atmospheric pollution events. The interaction of the oxidizing atmosphere with soot results in the formation of reactive species of intermediate oxidation states that undergo potentially important atmospheric reactions. A case in point may be $NO_y$ to $NO_x$ conversion reactions that may in part be mediated by heterogeneous reactions on soot. New (unpublished) results on the heterogeneous reactions of $N_2O_5$ and $NO_3$ recently obtained in our laboratory complete the picture on the $NO_y$ reactions on two types of decane ($C_{10}H_{22}$) flame soot that represent two extremes in terms of physical-chemical properties, one originating from a rich and the other from a lean flame resulting in “gray” and “black” soot. Both the organic soluble fraction as well as the distribution of functional groups on these two types of soot are significantly different and are responsible for the different observed reactivities with the $NO_y$ family. Both the kinetics (uptake coefficient) as well as the reaction products of $NO_3$ and $N_2O_5$ will be presented and critically compared to corresponding data from the interaction of $NO_2$, HONO and $HNO_3$ on the same type of soot.