



Catalysis and Ionic Transformations of Organic Compounds in Atmospheric Aerosols: a Decade of Discoveries

B. Nozière (1), P. Dziedzic (2), and A. Córdoba (2)

(1) Stockholm University, Applied Environmental Science, Stockholm, Sweden, (2) Stockholm University, Department of Organic Chemistry, Stockholm, Sweden

While radical reactions were thought for a long time to be the main fate of organic compounds in atmospheric aerosols, a number of catalysts making ionic reactions of these compounds efficient in aerosols have been identified in the last decade: strong acids,^{1,2} amino acids,^{3,4} and, more recently, inorganic salts.^{5,6} Unlike radical oxidations, ionic reactions such as aldol condensation or acetal formation have the peculiarity to form new C-C, C-O, or C-N bonds. They can thus produce oligomers that can not be formed by radical processes and might play important roles on the optical properties of the aerosols,^{3,7} or the formation of secondary organic aerosols (SOA) in the case of specific carbonyl compounds such as glyoxal.^{5,8}

This presentation proposes an overview of this first decade of findings. The efficiency and atmospheric relevance of the different catalysts will be compared in term of kinetics. Current estimates of the contribution of these reactions to the optical properties of aerosols, the uptake of organic gases, and the formation of SOA will be proposed based on the latest laboratory results and field observations.

References

- ¹Duncan, J. L., L. R. Schindler, J. T. Roberts, *Geophys. Res. Lett.*, 25, 631, 1998.
- ²Jang, M., N. M. Czoschke, S. Lee, R. M. Kamens, *Science*, 298, 814, 2002.
- ³Nozière, B., Dziedzic, P., Córdoba, A., *Geophys. Res. Lett.*, 34, L21812, doi:10.1029/2007GL031300, 2007.
- ⁴Nozière, B., Córdoba, A., *J. Phys. Chem. A*, 112, 2827, 2008.
- ⁵Nozière, B., Dziedzic, P., Córdoba, A., *J. Phys. Chem. A*, 113, 231, 2009.
- ⁶Nozière, B., Dziedzic, P., Córdoba, A., *Atmos. Chem. Phys. Discuss.*, 9, 1, 2009.
- ⁷Nozière, B., W. Esteve, *Geophys. Res. Lett.*, 32, L03812, doi:10.1029/2004GL021942, 2005.
- ⁸Galloway, M.M., P. S. Chhabra, A. W. H. Chan, J. D. Surratt, R. C. Flagan, J. H. Seinfeld, and F. N. Keutsch, *Atmos. Chem. Phys. Discuss.*, 8, 20799, 2008.