

Forschungszentrum Jülich, Jülich, Germany (FZJ)

Expertise and Experience

The Institut für Chemie und Dynamik der Geosphäre, Institut II: Troposphäre (before: Institut für Atmosphärische Chemie) of the Forschungszentrum Jülich (FZJ) has an over 25 year experience in the field of Atmospheric Chemistry.

The FZJ group succeeded with the build-up and the characterisation of the first large aerosol chamber for the investigation of nighttime heterogeneous chemistry. Kinetic studies in this chamber yield important contributions to the understanding of slow gas-phase reactions and fast heterogeneous conversion of nitrogen oxides in the nocturnal atmosphere. During the last years, the kinetic studies in the chamber were extended by in-situ studies of the chemical processing the condensed phase of aerosols.

Under the guidance of Dr. Andreas Wahner, now director of the institute, the atmosphere simulation chamber SAPHIR (Simulation of Atmospheric PHotochemistry In a large Reaction Chamber) was built and went operational in fall 2001. This chamber is a unique tool for the quantitative experimental investigation of tropospheric photochemistry under natural conditions and the evaluation of photochemical models. Its outstanding features are: Clean air supply for simulation of remote atmospheres, variable access to the measurement volume for instruments and wide range of field-tested equipment for trace gas measurements

The group has also participated in and coordinated a number of national and international field campaigns such as POPCORN, ALBATROSS, and BERLIOZ. The group has participated successfully and contributed substantially to a high number of EC funded research projects.

Professional Experience

Dr. Theo Brauers is research scientist at the Institut für Chemie und Dynamik der Geosphäre (ICG-II: Troposphäre). He works since 15 years in the field of atmospheric chemistry. His special interest is the spectroscopic measurement of radicals using Differential Optical absorption spectroscopy (DOAS). Together with Dr. Hans-Peter Dorn and Dr. Martin Hausmann he developed a new DOAS instrument for the direct and absolute measurement of OH radicals in the troposphere. This OH DOAS instrument was successfully employed in several field and ship-based campaigns and was recently transferred and set-up at SAPHIR. In 1996 Dr. Brauers was responsible for the design and set-up of a laboratory aerosol chamber at the University of California at Irvine. This chamber incorporated several spectroscopic and non-spectroscopic techniques. Dr. Brauers also coordinates the technical development and the experiments at the SAPHIR chamber (since 2002).

Dr Thomas F. Mentel is research scientist at the Institut für Chemie und Dynamik der Geosphäre (ICG-II: Troposphäre). He works since about 10 years in the field of heterogeneous atmospheric chemistry. He has over 15 year experience in quantitative infrared spectroscopy in gas phase and condensed phase systems. His special interests are the in-situ IR-spectroscopy and the thermodynamic modelling of aqueous aerosols. He is an experienced specialist in kinetic measurements of heterogeneous reactions in dispersed aerosol systems of atmospheric relevance. Together with Dr. Andreas Wahner he established novel methods for the measurement of the heterogeneous nighttime chemistry of nitrogen oxides in the Institut für Atmosphärische Chemie at the Forschungszentrum Jülich. He collaborated in the EU project AERONOX SP2 and was coordinator in the EU project HECONOS. In 1999 he organized an educative international Aerosol Workshop "Tropospheric Aerosols: Airborne

Reactive Surfaces" at the FZJ. Since November 2001, Dr. Thomas Mentel coordinates the EU Project CASOMIO.

RECENT/CURRENT EC PROJECTS

- AERONOX The impact of NO_x emissions from aircraft upon the atmosphere at flight altitude 8 –15 km (EV5V-CT-91-0044)
- CASOMIO Condensational growth and surface reactivity of mixed inorganic and organic aerosols (EVK2-CT-2001-00124)
- HECONOS Heterogeneous conversion of nitrogen oxides on aerosol surfaces (ENV4-CT97-0407)
- MARATHON Marine atmosphere oxidation capacity experiment (ENV4-CT95-0004)

RECENT PUBLICATIONS

- Barney, W.S., Wingen, L.M., Lakin, M.J., Brauers, T., Stutz, J., Finlayson-Pitts, B.J. (2000): Infrared absorption cross-section measurements for nitrous acid (HONO) at room temperature, *J. Phys. Chem. A* **104**, 1692-1699.
- Brauers, T., Hausmann, M., Bister, A., Kraus, A., Dorn, H.-P. (2001): OH radicals in the boundary layer of the Atlantic Ocean. First measurements by long-path laser absorption spectroscopy, *J. Geophys. Res.* **106**, 7399-7414.
- DeHaan, D.O., Brauers, Th., Oum, K., Stutz, J., Nordmeyer, T., Finlayson-Pitts, B.J. (1999): Heterogeneous chemistry in the troposphere: Experimental approaches and applications to the chemistry of sea salt particles, *Int. Rev. Phys. Chem.* **18**, 343-385.
- Folkers, M., Mentel, Th.F., Wahner, A. (2003): Influence of an organic coating on the reactivity of organic aerosols, *Geophys. Res. Lett.* (submitted)
- Geiger, H., Barnes, I., Becker, K.H., Bohn, B., Brauers, T., Donner, B., Dorn, H.-P., Elend, M., Freitas Dinis, C.M., Grossmann, D., Hass, H., Hein, H., Hoffmann, A., Hoppe, L., Hülsemann, F., Kley, D., Klotz, B., Libuda, H.G., Maurer, T., Mihelcic, D., Moortgat, G.K., Olariu, R., Neeb, P., Poppe, D., Ruppert, L., Sauer, C.G., Shestakov, O., Somnitz, H., Stockwell, W.R., Thüner, L.P., Wahner, A., Wiesen, P., Zabel, F., Zellner, R., Zetzsch C. (2002): Chemical mechanism development: Laboratory studies and model applications, *J. Atmos. Chem.* **42**, 323-357.
- Hausmann, M., Brandenburger, U., Brauers, T., Dorn H.-P. (1999): Simple Monte Carlo methods to estimate the spectra evaluation error in differential-optical-absorption spectroscopy, *Appl. Opt.* **38**, 462-475.
- Krischke, U., Staubes, R., Brauers, T., Gautrois, M., Burkert, J., Stöbener, D., Jaeschke, W. (2000): Removal of SO₂ from the marine boundary layer over the Atlantic Ocean: A case study on the kinetics of the S(IV) oxidation on marine aerosols, *J. Geophys. Res.* **105**, 14413-14422.
- Mentel, Th.F., Sohn, F., Wahner, A. (1999): Nitrate effect in the heterogeneous hydrolysis of dinitrogen pentoxide on aqueous aerosols, *Phys. Chem. Chem. Phys.* **1**, 5451-5457.
- Wingen, L.M., Barney, W.S., Lakin, M.J., Brauers, T., Finlayson-Pitts, B.J. (2000): A unique method for laboratory quantification of gaseous nitrogen acid (HONO) using the reaction HONO + HCl → ClNO + H₂O, *J. Phys. Chem. A* **104**, 329-335.