Abstract

The increasing pressure of population growth and industrialisation causing local air pollution have become a matter of concern both on a local as well as on a global scale. Man-made pollution has become competitive with nature's own cycles and is threatening to perturb long-established ecological balances at a rapid pace. The urge to understand the chemistry of the atmosphere has increased with growing concern about the environment. This also requires knowledge about the mechanisms by which compounds are transformed, transported, and ultimately removed from the atmosphere.

In this thesis a number of processes in both the gas phase and in the condensed phase have been investigated.

Reactions between aldehydes and reactive species such as Cl-atoms, OH and NO_3 radicals were studied using a reaction chamber and a Fast-flow discharge tube. Kinetic measurements were performed on different saturated and unsaturated aldehydes. For saturated aldehydes the initial attack is mainly C-H abstraction from the carbonylic hydrogen. A combination of both C-H abstraction and addition to the C=C double bond takes place for the unsaturated aldehydes.

The reaction rate and mechanism is discussed in terms of radical and structure of the aldehyde.

The heterogeneous uptake, γ, of SO_2 on mineral dust was investigated with DRIFTS and Knudsen cell technique. The dust sample was collected from the Cape Verde Islands and represents mineral dust from the Saharan desert. It was shown that the heterogeneous oxidation of SO_2 to surface sulphate on mineral dust is possible if an oxidising agent, such as O_3 and NO_2, is present. The SO_2 is reversibly adsorbed to the surface prior to the oxidation step. Only part of the adsorbed SO_2 is ending up as sulphate.

For the DRIFTS experiments reactive uptake coefficients, γ_{rxn}, were obtained while for the Knudsen cell experiments produced total uptake coefficients, γ_{total}.

Keywords: tropospheric chemistry, gas phase, heterogeneous, kinetics, mechanism, aldehydes, SO_2, mineral dust

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