

Mineral surfaces: From epitaxy of carbon to transformation of organics

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Recently the interest to the investigation of natural organic matter increases. Firstly, organic matter is a basic natural generator and source of carbon-containing resources; secondly, it is a decisive factor of biogeochemical processes of natural ecosystems. Problems at extraction and processing of carbon-containing raw are genetically inherent, and to solve them it is necessary to study the interrelation of structural content and physical-chemical characteristics and also the mechanisms of their directional transformations.

The surface of minerals is a nice ground to study the natural processes. The knowledge on the surface physics, including authors' publications, has been used. The surface center plays a great role in transformation of organics. The dependence of the kinetics of surface processes and transformation of organic matter on the physical parameters with the use of achievements in the sphere of mineral surface physics has been revealed. The organics-mineral surface model has been represented. The mechanism of physical and chemical surface coordination of organic-mineral complexes, transformation of organics at mineral surfaces have been studied as the basis for the theory of the fundamental role of organics for environment and various technologies.

The plasma deposition of carbon or hydrocarbon molecules has been set as an example.

Ozonolysis of (*E*)-beta-farnesene: Carbonyl products and secondary organic aerosol yields

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Sesquiterpenes are amongst the shortest lived organic species due to their high reactivity toward the atmospheric oxidants (O_3 , OH and NO_3 radicals) and have shown to give remarkably high aerosol yields. To date, a number of laboratory studies have been performed on a series of sesquiterpenes with cyclic structures; however, there is a lack of information concerning the atmospheric reactivity of (*E*)- β -farnesene, an acyclic compound emitted from a wide range of plants [1]. (*E*)- β -farnesene contains four double bonds and is therefore expected to be highly reactive towards atmospheric oxidation and a likely source of free radicals, oxygenated organic compounds and secondary organic aerosol (SOA) in the Earth's atmosphere.

This study presents, for the first time, results from the ozonolysis of (*E*)- β -farnesene. The experiments were performed in a 3.91 m³ atmospheric simulation chamber at 296 \pm 2 K to determine gas phase oxidation products and SOA yields in a presence and absence of OH scavengers (i.e., CO, cyclohexane and 2-butanol) and at different humidity levels.

A number of carbonyl compounds have been observed as gas phase reaction products and included acetone, 4-methylenehex-5-enal, 6-methylhept-5-en-2-one, (*E*)-4-methyl-8-methylenedeca-4,9-dienal, methylglyoxal, and 4-oxopentanal. A reaction mechanism has been proposed to explain these experimental observations.

Ozonolysis of (*E*)- β -farnesene resulted in relatively large SOA yields varying from 30 to 45% depending on the experimental conditions. Relative humidity and the presence of OH scavengers were found to decrease SOA yields.

The results obtained in this study provide additional insights into the role of biogenic emissions in the chemistry of the atmosphere. They indicate that (*E*)- β -farnesene is a source of the ubiquitous carbonyls acetone and 4-oxopentanal and also an efficient precursor for the formation of biogenic SOA.

[1] Duhl *et al.* (2008) *Biogeosciences* **5**, 761-777.