c hemisch
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Gegründet im Jahre 1869 von H. Hlasiwetz, J. Loschmidt, J. Petzval und J. Stefan

EINLADUNG

zum Vortrag von

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Cooperative Surface Structure of Model Sea-Spray Aerosol Surfaces

am Dienstag, 10. Dezember 2024, um 17:30 Uhr

Ort: Lise-Meitner-Hörsaal, Fakultät für Physik, Universität Wien,
1090 Wien, Strudlhofgasse 4 / Boltzmanngasse 5, 1. Stock

Barrierefreier Zugang: Boltzmanngasse 5, Lift, 1. Stock rechts über den Gang zum Hintereingang des Hörsaals

Abstract:

While greenhouse gases have a pronounced warming effect on our climate, aerosols have a net cooling effect due to their ability to reflect and scatter incoming solar radiation, and to act as cloud condensation nuclei. To determine an aerosol's efficiency to nucleate cloud growth, one needs to accurately model their hygroscopicity, i.e. how easily they take up water, over time. This strongly depends on the molecular composition of the surface layer, which can vary depending not only on the environment the aerosol is in but also on the degree of particle ageing. Ageing mainly describes the successive oxidation of compounds contained within the aerosol, continuously changing the particle's composition and properties.

One of the largest sources of natural aerosol is sea spray, which generates aqueous aerosols containing a wide range of organic and inorganic compounds. While the surface propensity of individual molecules has been studied widely, much less is known about cooperative effects in more complex mixed systems, making it challenging to predict the properties of the surface layer. Specifically, it is not fully known to what degree the organic and inorganic fraction contained within aqueous aerosols interact to give rise to the overall surface structure.

Here, we use sum-frequency-generation (SFG) spectroscopy in conjunction with surface tension experiments to study the surface composition and structure of solutions containing common short and long chain organic acids and alcohols. Specifically, we investigate how the salinity and pH of the aqueous subphase may alter the structure of the organic surface layer.

Using this approach, we find that the nature of the inorganic fraction has a clear impact on the composition and structure of the mixed surface: In the case of subphase salinity, the overall availability of organic molecules largely follows Langmuir absorption. However, the structuring of the aqueous sub-surface layers is clearly affected by the presence of ions. When adjusting the pH of the system we find even more pronounced changes in the surface film. Both the organic coverage and the water structure of the surface vary strongly across the pH range. These results show that even subtle environmental changes may lead to pronounced shifts in surface architecture, which is known to play a key role in aerosol hygroscopicity.

Literature:

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