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Heterogeneous Chemistry on the Ice Surfaces

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The porous nature of ice surfaces, especially of snow crystals, allows for adsorption of volatile and semivolatile organic compounds. Contrary to frozen aqueous solutions, in which the impurities reside in a 3-dimensional cage (micropockets), contaminant molecules located on a snow grain surface at low concentrations can be visualized in terms of a 2-dimensional cage. Low concentrations of snow contaminants and the complexity the system are a great challenge to those who want to study the physical and chemical processes occurring in natural snow.

We investigated the surface coverage of artificial snow grains by organic contaminants in relation to their surface self-association, diffusion, and chemical reactions, such as radical recombination, ozonolysis, or redox processes. Our studies have revealed that hydrophobic organic molecules can be located on the surface of snow grains in associations rather than as isolated species even at very low concentrations. The results from investigations on photochemistry of ice surface contaminants in the absence or presence of semiconductor nanoparticles or humic acids, using various study techniques, including fluorimetry or scanning electron microscopy, will be presented.