



Innsbruck Physics Colloquium

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Spectroscopy of Silicon Molecules and Nanoclusters: Unusual Structure and Bonding by Doping and Hydrogenation

Silicon clusters, silane molecules, and their derivatives and ions are fundamental species in a variety of chemical disciplines, ranging from organic and plasma chemistry to materials science, astrochemistry, and theory of chemical bonding. However, in contrast to the well-studied related hydrocarbon ions, very little information is available for the corresponding silicon cations. Although C and Si are both group IV elements, their chemical behavior is rather different. We determine the geometric and electronic structure and unusual chemical bonding of simple to medium-sized Si_nH_m^+ cations ($n=1-10$) by infrared spectroscopy of size-selected species generated in a cold supersonic plasma beam and quantum chemical calculations. Highlights include the first detection of Si-H-Si three-center two-electron bonds, the identification of inorganic Si-H-Si-H-Si hydride wires in supersaturated molecules, and the characterization of simple elusive silanols. Along a second route, we employ infrared spectroscopy with free electron lasers to determine the effects of doping small silicon clusters ($n \leq 10$) with first row elements Be-O on their geometric and electronic structure. Doping on the nanoscale produces a large variety of novel nanostructures very different from bulk material and allows for engineering their electronic and thus optical properties.

Tuesday, 26.3.2019, at 17:15 h in lecture hall C