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Gas-phase X-ray absorption spectroscopy: clusters and coordination complexes

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The spectroscopy of molecular compounds in the gas-phase delivers valuable information on the intrinsic properties of the molecule or cluster because there is no environment, such as a surface or a solvent, which may disturb the structural and electronic properties of the compound. Moreover, it allows the investigation of highly reactive or unstable species which may have very short lifetimes when deposited or prepared in solution. In the case of x-ray absorption spectroscopy, where monochromatized x-rays of variable energy are required, the available photon flux is limited and thus the study of the highly dilute gas-phase samples is challenging. By using an ion trap, a sufficiently high sample density can be achieved in order to measure the x-ray absorption in ion yield mode. The ion production is independent of the ion trap and thus both sputtering from the solid material or electrospraying of the sample in solution are available as ion sources. With the electrospray ion (ESI) source it is thus possible to investigate chelate or coordination complexes where the element specificity of x-ray absorption spectroscopy is especially valuable as it makes it possible to selectively address the ligand(s) or the metal atom. In this contribution, the NanoclusterTrap endstation at BESSYII at the Helmholtz Zentrum Berlin will be introduced and results from the recently commissioned dedicated electrospray ion (ESI) source will be presented.

Summary

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