

Rock and Roll at 0.37 K
- High-resolution spectroscopy of microsolvated clusters -

Martina Havenith

Ruhr University Bochum, Physical Chemistry II, 44801 Bochum, Germany,
Tel.: 0234-3224249, Fax: 0234-3214183, E-mail: martina.havenith@rub.de

Using a high resolution IR spectrometer in combination with a helium nanodroplet beam set-up we were able to study aggregation or microsolvation at ultracold conditions. We will report on the observation and assignment of $(\text{HCl})_x\text{-(H}_2\text{O)}_y$, acetylene-furan complexes and pyridine- H_2O complexes at ultracold temperatures. Helium nanodroplets provide a soft, suprafluid and ultracold (0.37 K) matrix that allows studying the solvation of pre-cooled moieties.

In order to understand aggregation at ultracold temperatures we have to take into account new aggregation pathways. Combined experimental and theoretical efforts provided evidence for transitions from a higher level local minimum to the global minimum state over a small barrier during the aggregation process. For acetylene-furan the experimentally observed structures can be explained by a step-by-step aggregation of moieties pre-cooled to 0.37 K that are steered by intermediate and short-range electrostatic interactions. Thus, we are able to unravel a special aggregation mechanism which differs from aggregation of molecules with large dipole moments such as HCl and H_2O where this aggregation process is dominated by long range $1/r^3$ dipole-dipole interaction ("electrostatic steering"). These mechanisms are more general concepts describing aggregation mechanism at ultracold temperatures.