GAS-PHASE IR SPECTROSCOPY OF LARGE CATIONIC CARBONACEOUS COMPOUNDS

JOS OOMENS, NICK POLFER, *FOM Institute for Plasma Physics "Rijnhuizen", Nieuwegein, The Netherlands*; GERT VON HELDEN, GERARD MEIJER, *Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin, Germany*.

Based on the observed IR emission and absorption spectra toward numerous celestial objects, large carbonaceous compounds are believed to be abundantly present in interstellar clouds. Polyaromatic hydrocarbons (PAHs) have received particularly much attention as they have been put forward as the carriers of the Unidentified Infrared bands[1]. Depending upon several factors, such as the local UV photon flux and electron density, these compounds are believed to be partly ionized. Obtaining laboratory IR spectra for large ionic species, however, is clearly not a sinecure and for cationic PAHs, mainly matrix-isolation spectroscopy has been applied in the past. Our approach has been to store the gas-phase cationic PAH species in an ion trap and record a multiple photon dissociation spectrum[2], using the widely tunable IR radiation from the Free Electron Laser for Infrared eXperiments (FELIX).

Recently, we have begun to investigate species other than regular PAH cations. For instance, fragments of aromatic species can easily be formed by UV photolysis. By generating these species in an ion trap and subsequent mass-selective isolation, IR spectra can be recorded that are not so easily accessible otherwise.

Another interesting class of carbonaceous molecules, which have been suggested to be present in interstellar environments[3], are diamondoids, i.e. small diamond-like carbon cages with hydrogen atoms on the outside to terminate the dangling bonds. Although the smallest member of the family, adamantane, can be synthesized and is widely available, the higher order diamondoids have been very rare. Recently, however, it was found by researchers from Chevron-Texaco that these species are present as trace amounts in petroleum[4]. At the meeting we will show IR spectra for several diamondoid molecules, both in the neutral and cationic state.

1. L.J. Allamandola, A.G.G.M. Tielens, J.R. Barker, *ApJ Suppl. Ser.* **71** 733 (1989).
2. J. Oomens, A.G.G.M. Tielens, B.G. Sartakov, G. von Helden, G. Meijer, *ApJ* **591** 968 (2003).
3. L.J. Allamandola, S.A. Sandford, A.G.G.M. Tielens, T.M. Herbst, *ApJ* **399** 134 (1992).
4. J.E. Dahl, S.G. Liu, R.M.K Carlson, *Science* **299** 96 (2003).