A FABRY-PEROT TYPE RESONATOR COBRA FT-MW SPECTROMETER FOR OPERATION FROM 2 TO 26.5 GHZ

DEIKE BANSER, MELANIE SCHNELL, and JENS-UWE GRABOW, *Lehrgebiet Physikalische Chemie A, Institut für Physikalische Chemie und Elektrochemie, Universtät Hannover, Callinstr. 3-3a, D-30167 Hannover*.

We present a Fourier transform microwave (FTMW) spectrometer with coaxially oriented beam-resonator arrangement (COBRA). The apparatus utilizes - like the original Balle-Flygare setup - a Fabry-Perot resonator for the interaction of the species under investigation with an electromagnetic field in the microwave region. Open resonators like this arrangement of spherical reflectors are especially suitable for molecular beam applications, where high vacuum conditions have to be maintained in the presence of large gas loads. In addition, such resonators provide the possibiliy for the implementation of further equipment, e.g. electrodes used for Stark effect measurements, leaving the microwave field sufficiently unaffected. On the other hand, open resonator structures allow for diffraction losses which limit the sensitivity in the lower frequency region of the spectrometer. Closed cavity resonators don't show diffraction losses and can be build at a reasonable size even for operation at wavelength in the decimeter region ($\nu < 3$ GHz) but loose the advantages mentioned for the Fabry-Perot setup.

The spherical reflector arrangement used in the presented setup modifies the commonly used geometry in order to extend the operation range as far as possible towards lower frequencies without compromizing the sensitivity of a Fabry-Perot setup at a reasonable size. Further, the choosen implementation of the resonator provides the possibility of accurate Stark effect measurements, even at low frequencies where the micowave field occupies a large volume for propagation in one of its gaussian modes.

Besides these more general features, we also implemented a number of other capabilities and extensions, most of them also directed towards the investigation of somewhat heavy transient species, i.e. moderately sized inorganic clusters. At its present stage the spectrometer includes, e.g., a twin laser-ablation source and a time-of-flight (TOF) mass spectrometer which will also be presented.