THE SEARCH FOR PROTONATED WATER CLUSTERS: THZ LASER SPECTRUM OF A PULSED SUPERSONIC SLIT DISCHARGE: D_2O^+, D_3O^+, OD

E. MICHAEL, C. KEOSHIAN, S. ANDERSON, and R. J. SAYKALLY, *Department of Chemistry, University of California Berkeley, Berkeley, CA 94720.*; J. M. BROWN, *Physical and Theoretical Chemical Laboratory, South Parks Road, Oxford OX1 3QZ, United Kingdom.*

Protonated water clusters have been the focus of theoretical interest for two decades, but few results on their spectra have been reported so far [a]. Research on neutral water clusters in the last few years has shown that a pulsed supersonic slit expansion source allows observation of spectra up to the hexamer [b]. Because of the stronger ion-dipole interaction and the expected higher binding energy of protonated water clusters (30 kcal/mol H2O), these might also be observable by using a pulsed slit source with a high current (high ionization degree) discharge [c].

We present very dense THz laser absorption spectra obtained with a NeHe/D_2O-operated discharge expansion in the range of 1000-2500 GHz (30-75 cm^{-1}), using an advanced pulsed discharge slit source. We present assignments of lines of the species OD, D_2O^+ and D_3O^+ and their hot band rotational lines, and discuss progress in assigning the many unassigned features.

[a] L. I. Yeh, Y. T. Lee, J. T. Hougen

[b] K. Liu, M. G. Brown, R. J. Saykally, J. Phys. Chem. A, 1997, 101, 8995; K. Liu, M. G. Brown, J. D. Cruzan, R. J. Saykally, J. Phys. Chem. A, 1997, 101, 9011; J. D. Cruzan, M. R. Viant, M. G. Brown, R. J. Saykally, J. Phys. Chem. A, 1997, 101, 9022; M. R. Viant, J. D. Cruzan, D. D. Lucas, M. G. Brown, and others, J. Phys. Chem. A, 1997, 101, 9032.

[c] D. T. Anderson, S. Davis, T. S. Zwier, D. J. Nesbitt