

OBSERVATION OF THE WEAKLY BOUND (HCl)₂H₂O CLUSTER BY CHIRPED-PULSE FTMW SPECTROSCOPY

ZBIGNIEW KISIEL, *Institute of Physics, Polish Academy of Sciences, Al. Lotników 32/46, 02-668 Warszawa, Poland*; ALBERTO LESARRI, *Departamento de Química Física y Química Inorgánica, Facultad de Ciencias, Universidad de Valladolid, E-47011 Valladolid, Spain*; JUSTIN NEILL, MATT MUCKLE, BROOKS PATE, *Department of Chemistry, University of Virginia, McCormick Rd., Charlottesville, VA 22904-4319*.

Investigation of small cluster formation in the H₂O + HCl binary system is expected to provide stepwise insight into the chemically fundamental process of ionization of the HCl molecule towards hydrochloric acid. Previous studies of the rotational spectra of this system in supersonic expansion resulted in detailed characterization of H₂O ··· HCl^a and (H₂O)₂HCl^b clusters, and in identification of the (H₂O ··· HCl) ··· Ar cluster.^c Many unassigned weak lines were observed but further progress was hindered by the multiple alternatives to assignment, particularly in the case of the deuterated mixture.

Application of the broadband, chirped-pulse FTMW technique reinvigorated the investigation of this system. The assignment of (H₂O ··· HCl) ··· Ar was completed and it was found that the strongest unassigned cluster was (HCl)₂H₂O. Identification of this cluster is confirmed by successfully fitted nuclear quadrupole hyperfine structure from the two chlorine nuclei, and observation of spectra for several isotopic species. Detailed results concerning the spectroscopy and properties of (HCl)₂H₂O are presented.

^aZ.Kisiel, B.A.Pietrewicz, P.W.Fowler, A.C.Legon, E.Steiner, *J. Phys. Chem. A* **104**, 6970 (2000).

^bZ.Kisiel, E.Białkowska-Jaworska, L.Pszczółkowski, A.Milet, C.Struniewicz, R.Moszynski, J.Sadlej, *J. Chem. Phys.* **112**, 5767 (2000).

^cZ.Kisiel, L.Pszczółkowski, E.Białkowska-Jaworska, O.Desyatnyk, M.J.Nowak, WH11, 59th International Symposium on Molecular Spectroscopy (2004).