PURE ROTATIONAL SPECTROSCOPY OF RARE GAS DIMERS BASED ON ROTATIONAL WAVE PACKET IMAGING

KENTA MIZUSE, *Department of Chemistry, School of Science, Kitasato University, Sagamihara, Japan*; YUYA TOBATA, *Department of Chemistry, Tokyo Institute of Technology, Tokyo, Japan*; URARA SATO, *Department of Chemistry, Kitasato University, Sagamihara, Japan*; YASUHIRO OHSHIMA, *Department of Chemistry, Tokyo Institute of Technology, Tokyo, Japan*.

We report time-domain rotational spectroscopy of argon dimer and krypton dimer by implementing time-resolved Coulomb explosion imaging of rotational wave packets. The rotational wave packets are created in the dimers with a ultrashort laser pulse, and their spatiotemporal evolution is fully characterized by measuring angular distribution of the fragment ions. The pump-probe measurements have been carried out up to a delay time of 16 ns. The alignment parameters, derived from the observed images, exhibit periodic oscillation lasting for more than 15 ns. Pure rotational spectrum of Ar_2 is obtained by Fourier transformation of the time traces of the alignment parameters. The frequency resolution in the spectrum is about 90 MHz, the highest ever achieved for Ar_2. The rotational constant and the centrifugal distortion constant are determined with much improved presision than the previous experimental results: B_0 = 1.72713(9) GHz and D_0 = 0.0310(5) MHz. The present B_0 value does not match within the quoted experimental uncertainty with that from the VUV spectroscopy, so far accepted as an experimental reference to assess theories. Spectrum of the krypton dimer will be also reported.