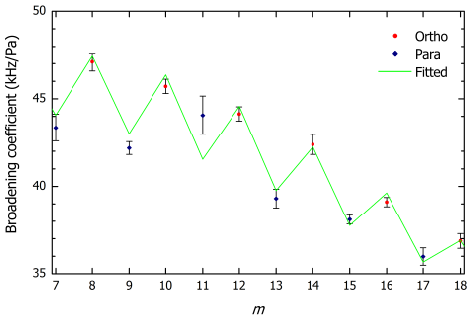
OBSERVATION OF ORTHO-PARA DEPENDENCE OF PRESSURE BROADENING COEFFICIENT IN ACETYLENE ν_1+ν_3 VIBRATION BAND USING DUAL-COMB SPECTROSCOPY

KANA IWAKUNI, *Department of Physics, Faculty of Science and Technology, Keio University, Yokohama, Japan*; SHO OKUBO, HAJIME INABA, ATSUSHI ONAE, FENG-LEI HONG, *National Metrology Institute of Japan (NMIJ), Ntional Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan*; HIROYUKI SASADA, *Department of Physics, Faculty of Science and Technology, Keio University, Yokohama, Japan*; KOICHI MT YAMADA, *National Metrology Institute of Japan (NMIJ), Ntional Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan*.

We observe that the pressure-broadening coefficients depend on the ortho-para levels. The spectrum is taken with a dual-comb spectrometer which has the resolution of 48 MHz and the frequency accuracy of 8 digit when the signal-to-noise ratio is more than 20[a].

In this study, about 4.4-Tz wide spectra of the $P(31)$ to $R(31)$ transitions in the ν_1+ν_3 vibration band of $^{12}C_2H_2$ are observed at the pressure of 25, 60, 396, 1047, 1962 and 2654 Pa. Each rotation-vibration absorption line is fitted to Voight function and we determined pressure-broadening coefficients for each rotation-vibration transition. The Figure shows pressure broadening coefficient as a function of m. Here m is $J" + 1$ for R and $-J"$ for P-branch. The graph shows obvious dependence on ortho and para. We fit it to Pade function considering the population ratio of three-to-one for the ortho and para levels. This would lead to detailed understanding of the pressure boarding mechanism.



[a] S. Okubo *et al.*, Applied Physics Express 8, 082402 (2015)