

MILLIMETER-WAVE SPECTROSCOPY OF S_2Cl_2 : A CANDIDATE MOLECULE FOR THE DETECTION OF *ORTHO-PARA* TRANSITION

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S_2Cl_2 is a candidate molecule for the detection of *ortho-para* transition, because the Cl atoms on the skewed position from the rotational principle axes give large off-diagonal terms in the quadrupole interaction, which can mix *ortho* and *para* states. In order to estimate the *ortho-para* mixing in a hyperfine-resolved rotational state, pure rotational transitions were measured by millimeter-wave spectroscopy using two different experimental set-ups. The transitions from the term value around 20 K was measured with a supersonic jet and those around 200 K were measured with a dry ice cooled gas cell. Hundreds of peaks were assigned for the naturally abundant $S_2^{35}Cl_2$ and $S_2^{35}Cl^{37}Cl$ isotopic species, and the rotational molecular constants including the fourth-order and sixth-order centrifugal distortion constants were determined. The hyperfine structures were partly resolved in some *Q*-branch transitions and those spectral patterns were well reproduced with the hyperfine constants determined by the previous FTMW spectroscopy in the cm-wave region^a. With the new molecular constants determined in this study and the previous hyperfine constants, it becomes possible to predict a more reliable *ortho-para* mixing ratio and to narrow down the possible candidate transitions in the mm-wave region for the detection of *ortho-para* transition.

^aMizoguchi et al., J. Mol. Spectrosc. 250,86-97(2008)