Laser Spectroscopic Study of CaH B (v=3, 5 and 7) -X (v=0) bands

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The electronic transitions of Calcium monohydride (CaH) have been found in the sunspot and M dwarf stars [1], and they are used to investigate the luminosity and surface gravity of those stars. Therefore, many spectroscopic studies have been carried out so far. The first laboratory spectroscopy of CaH was carried out in 1925 on the $C^2\Sigma^+$ - $X^2\Sigma^+$ transitions in the near-UV region [2]. Recently, high precise measurements of CaH were reported [3, 4]. In addition to the astronomical interests, CaH draw a structural interest for its avoided crossing between the $B^2\Sigma^+$ and $D^2\Sigma^+$ electronic states and the resultant double minimum potential. We are interested in their interactions with other electronic states and the rotational and vibrational structure near the potential barrier. In our previous work, we found interaction between the B state and the D state by non-adiabatic effect as energy shifts in vibrational levels [5]. In this work, we measured the region between v=2 and 9 and tried to bridge the gap.

We investigated the region from 19100 cm^{-1} to 21000 cm^{-1} by laser-induced fluorescence and observed three vibrational bands. We assigned those bands to the B (v=3, 5 and 7) - X (v=0) transitions. The rotational constants, *B*, of the v=5 and 7 state is about 2/3 of those of the v=0 - 3. This indicate that v=5 and 7 states lies above the potential barrier. Local perturbations were also observed in the rotational of the B (v=3) state. In this talk, we report on the assignments of these newly observed vibrational levels and discuss the observed perturbations.

References

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