ANALYSIS OF THE QUASI-LINEARITY OF THE $\tilde{B}\ ^1A_1$ STATE OF SiH_2 and SiD_2 RADICALS

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Recently we have observed OODR transitions terminating to the $\tilde{B}\ ^1A_1$ state of SiH_2 and SiD_2. The OODR spectra observed indicate the quasi-linear behavior in the $\tilde{B}$ state based on the following features.

Even or odd-v_2 levels exclusively appear in the OODR via an intermediate K_a=odd or even rotational level. This even/odd-v_2 progression is a typical pattern in the case of bent-linear transition. That is, SiH_2 acts as a linear molecule in the $\tilde{B}$ state and its bending vibration is doubly degenerate. Thus there exist a vibrational angular momentum ℓ. The intensity pattern comes from a selection rule of a *c*-type transition; $\Delta(\ell - K_a) = \pm 1$.

Bending excited levels exhibit negative g_{22}-values. This is an indication of the double minimum potential. If an electronic state of interest was doubly degenerate, there would be a possibility of Renner-Teller effect. However, the $\tilde{B}$ state correlates to $^1\Sigma^-$ state in the linear configuration. Thus, this double minimum potential originates from the quasi-linearity. The height of the barrier to the linearity was calculated to be about 200 cm^{-1}.[a] It was confirmed that there are only $\ell(K_a) = 0$ rotational levels in the $v_2 = 0$ level. This means that the $v_2 = 0$ level is located above the barrier to linearity. It is very probable considering the very low barrier height. In addition, the absolute value of the g_{22} constant rapidly decreases as the v_2-value increases.

These observations strongly support the quasi-linearity of the $\tilde{B}$ state. In the presentation, results of the vibrational analysis on the quasi-linearity will be discussed.

[a] I. Tokue, private communication