# 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 $\ell$. 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