

## CH<sub>3</sub> INTERNAL ROTATION IN 9-METHYLANTHRACENE

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We observed the rotationally resolved fluorescence excitation spectrum of the  $S_1 \leftarrow S_0$  transition of jet-cooled 9-methylantracene. The potential energy curve for CH<sub>3</sub> internal rotation is six-fold symmetric. The barrier to rotation ( $V_6$ ) is  $\sim 120 \text{ cm}^{-1}$  [2], which is considerably larger than that of toluene ( $\sim 5 \text{ cm}^{-1}$ ) [1]. The  $V_6$  value is the energy difference between two isomers ‘*staggered*’ and ‘*eclipsed*’. The main contribution to  $V_6$  is expected to be hyperconjugation, which is the  $\pi$ -like interaction between the aromatic  $\pi$  orbital and methyl  $\text{sp}^3$  orbital.

The final goal of this work is to quantitatively elucidate the vibrational and rotational energy levels for CH<sub>3</sub> internal rotation. It is essential to observe the high-resolution and high-precision electronic spectra and theoretically search the best effective Hamiltonian to reproduce the experimental results. We are now developing a new laser control system with optical frequency comb locked to GPS, and an ab initio method which provides the reliable potential energy curve.

[1] M. Baba, et al., J. Phys. Chem. A **113**, 2369 (2009)

[2] D. R. Borst and D. W. Pratt, J. Chem. Phys. **113**, 3658 (2000)