ULTRAHIGH-RESOLUTION SPECTROSCOPY OF ANTHRACENE

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Rotationally resolved fluorescence excitation spectra of the $S_1\ ^1B_{2u} \leftarrow S_0$ transition of anthracene-h_{10} and anthracene-d_{10} and the change with the magnetic field have been observed in a collimated molecular beam. Recently, the rotational constants in the S_0 and S_1 states of anthracene-h_{10} have been reported by Bendkowsky $et\ al.$ [a] We have assigned about 1000 rotational lines and determined more accurate values. We have also performed theoretical calculations and obtained the molecular structure, of which the rotational constants are almost the same as the experimental values. The Zeeman broadening was very small and approximately the same for anthracene-h_{10} and anthracene-d_{10}. It indicates that mixing with the triplet state is very small in the $S_1\ ^1B_{2u}$ state. The fluorescence quantum yields of anthracene-h_{10} and anthracene-d_{10} are 0.67 and 0.13, respectively. [b] It is concluded that the main nonradiative process in the S_1 state of the isolated anthracene molecule is not the intesystem crossing to the triplet state, but the internal conversion to the ground state.

[a] V. Bendkowsky, E. Heinecke and A. Hese, *J. Chem. Phys.*, **127**, 224306 (2007)
[b] M. Sonnenschein, A. Amirav and J. Jortner, *J. Phys. Chem.*, **88**, 4214 (1984)