

S<sub>2</sub> - S<sub>0</sub> FLUORESCENCE, MOLECULAR STRUCTURE, AB INITIO CALCULATIONS, AND QUANTUM BEAT SPECTROSCOPY OF SILYLIDENE (H<sub>2</sub>C=Si)

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Strong S<sub>2</sub> - S<sub>0</sub> fluorescence has been observed in LIF spectra of jet-cooled silylidene, H<sub>2</sub>C=Si, produced by fragmentation of tetramethylsilane in a pulsed discharge jet. The experimental ground and excited state molecular structures have been obtained for the first time from rotational analyses of the 0<sub>0</sub><sup>0</sup> bands of H<sub>2</sub>C=Si and D<sub>2</sub>C=Si. These bands exhibit pronounced rotational level intensity anomalies indicative of nonradiative decay processes. Quantum beats are observed in the fluorescence decay of almost every rotational level in v' = 0 and in most of the higher vibrational levels. Fourier transforms of the beat patterns show line broadening and splittings at small magnetic fields of 10 - 70 Gauss. High quality ab initio studies have been done to locate the interacting electronic states and predict their vibrational frequencies and molecular structures.