LASER SPECTROSCOPIC DETECTION OF THE JET-COOLED SnCH₂ MOLECULE

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The stannylidene (SnCH₂) molecule has been detected for the first time in the gas phase by supersonic expansion/laser spectroscopy. This transient molecule was produced in an electric discharge through a dilute mixture of tetramethyltin [(CH₃)₄Sn] in high-pressure argon and studied by laser induced and dispersed fluorescence through the B ¹B₂ - X ¹A₁ transition. The vibronic energy levels of the ground and excited states have been measured for both SnCH₂ and SnCD₂. The observed vibrational frequencies, partially resolved rotational band contours, deuterium isotope shifts, and electronic excitation energies are in accord with our predictions from ab initio calculations. This novel species has an unusual tin-carbon double bond in the ground state. It is the third in the series of X=CH₂ (X = Si, Ge and Sn) group IVA vinylidene species we have been able to produce and study in the gas phase.