RENNER-TELLER EFFECTS IN THE $^2\Pi_i$ GROUND STATES OF THE SiCH/SiCD and GeCH/GeCD RADICALS

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Extensive emission spectra have been obtained by laser excitation of selected bands of the $\tilde{A}\ ^2\Sigma^+$ - $\tilde{X}\ ^2\Pi_i$ systems of jet-cooled SiCH, SiCD, GeCH and GeCD. Up to four quanta of the Si-C or Ge-C stretching mode and even quanta of the bending mode have been observed by pumping upper state Σ vibronic levels. Pumping vibronically induced transitions to upper state Π vibronic levels has given further information about odd quanta of the bending mode. The assignments have been fitted using a vibronic coupling matrix that includes spin-orbit coupling, Renner-Teller effects, Fermi resonances, and the interaction between nearly degenerate bending levels of different ν_2 and K. The emission spectra of SiCH and SiCD, with $A \approx \epsilon\omega$, are easily assigned and the Fermi resonance interaction between $2\nu_2$ and ν_3 is found to be small. In the germanium species, the spin-orbit coupling is much larger than $\epsilon\omega$ and the spectra are more complicated. Levels of different ν_2 with $\Delta\nu_2 = \pm 1$ are mixed by a ΔP = 0, $H_{RT} \times H_{SO}$ cross-term of substantial magnitude, disrupting the energy level pattern. Results from the vibronic analyses of all four species will be presented.