FOURIER-TRANSFORM MW SPECTROSCOPY OF THE SH($^2\Pi_i$)-Ar AND SD-Ar RADICAL COMPLEXES

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We have studied the SH($^2\Pi_i$)-Ar and SD-Ar radical complexes with FTMW spectroscopy. The complexes were produced in a supersonic free jet by a pulsed discharge of H_2S or D_2S, which was diluted to 0.35% in Ar with a stagnation pressure of 2 atm. R-branch transitions in the lower spin-orbit component (Ω=3/2) for the linear $^2\Pi_i$ radicals were observed for $J'' = 3/2$ to $J'' = 15/2$ in the 8 - 26 GHz region. The transitions were split into two parity components owing to the parity doubling. Each parity component was split further due to the magnetic hyperfine interaction associated with the H/D nucleus.
Rotational constants for SH-Ar and SD-Ar were determined to be 1569.656(2) and 1567.707(2)MHz respectively. The value for SH-Ar agrees well with that of a previous LIF study.[a] From the SH/SD data, it was confirmed that the argon atom is located at the hydrogen side of the SH radical. With an assumption that the S-H bond length is equal to that in the monomer, the H-Ar distance is calculated to be 2.900 Å, which is about 0.1 Å longer than that in OH-Ar. The effective D_J constants of SH-Ar and SD-Ar were found to have negative values of -58.4(7) and -50.7(6) kHz respectively.

[a]Min-Chieh Yang, Aldo P. Salzberg, Bor-Chen Chang, Christopher C. Carter, and Terry A. Miller, J.Chem.Phys. 98 (1993) 4301.