THE MILLIMETER/SUBMILLIMETER SPECTRUM OF LISH($\tilde{X}^1A'$): FURTHER INVESTIGATIONS OF THE METAL-SULFUR BOND

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The pure rotational spectra of LiSH ($\tilde{X}^1A'$) and two of its isotopomers (^{6}LiSH, LiSD) were recorded using millimeter/submillimeter-wave direct absorption techniques. The molecule was produced by reacting lithium vapor with H_2S in the presence of a d.c. discharge. Transition ranging from J = 1 $\rightarrow$ 2 to J = 13 $\rightarrow$ 14, spanning the region of 73-520 GHz, were measured for ^{7}LiSH, as well as 3-4 transitions for the ^{6}Li and deuterium isotopomers. The spectra showed an extensive K_a ladder structure for the three species, which is consistent with the molecule being an asymmetric top. Rotational constants for all three molecules have been determined, as well as r_0 and $r_m^{(1)}$ structures for LiSH. This study shows that this molecule is bent, with $\Theta = 93°$ and therefore is significantly different from the quasilinear LiOH. This structural change likely results from more covalent bonding in LiSH.