

## THE MILLIMETER/SUBMILLIMETER SPECTRUM OF CUSH( $\tilde{X}^1A'$ ): INVESTIGATION OF THE TRANSITION METAL SULFUR BOND

A. J. JANCZYK and L. M. ZIURYS, *Department of Chemistry, Department of Astronomy, and Steward Observatory, University of Arizona, Tucson, AZ, 85721.*

The pure rotational spectra of  $^{63}\text{CuSH}$  and  $^{65}\text{CuSH}$  and its deuterated isotopomers were recorded using millimeter/submillimeter-wave direct absorption techniques. The molecule was produced by reacting copper vapor with  $\text{H}_2\text{S}$  in the presence of d.c. discharge. Transitions ranging from  $J = 24 \rightarrow 25$  to  $J = 50 \rightarrow 51$  spanning the region of 262 - 538 GHz were measured for  $^{63}\text{CuSH}$  and  $^{65}\text{CuSH}$ , as well as transitions  $J = 32 \rightarrow 33$  to  $J = 39 \rightarrow 40$  for the deuterated species. The spectra showed extensive  $K_a$  ladder structure for all species, which is consistent with the molecule being an asymmetric top. Rotational constants, as well as an  $r_0$  structure, have been determined for the molecule. This study shows that the molecule is bent with a Cu-S-H angle of  $\Theta = 93.6^\circ$ , and therefore is different from CuOH, which has a Cu-O-H angle of  $\Theta = 110.1^\circ$ . This striking variation in geometry likely results from a lack of hybridization in the CuSH molecule.