SUBMILLIMETER SPECTROSCOPY OF ZnOH (X^2A'): STRUCTURE AND BONDING IN 3d HYDROXIDE SPECIES

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The ZnOH radical (X^2A') has been observed in the laboratory using mm/sub-mm direct-absorption techniques. This is the first gas-phase laboratory spectroscopic study of this radical. ZnOH was produced by reacting zinc vapor with H_2O or H_2O_2 under DC discharge conditions. Multiple rotational transitions have been recorded in the 400-540 GHz range that clearly exhibit K-ladder structure, indicative of a bent molecule. the pattern has been observed in three zinc isotopologues: ^{64}ZnOH, ^{66}ZnOH, and ^{68}ZnOH. Each line consists of spin-rotation doublets with a splitting of $\sim$180-190 MHz, characteristic of zinc. The data are currently being analyzed and rotational and spin-rotation constants will be presented. The bent geometry suggests predominantly covalent bonding between zinc and oxygen.