MILLIMETER WAVE SPECTRUM OF CoCO($X^2\Delta_i$) IN THE GROUND AND VIBRATIONALLY EXCITED STATES

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Rotational spectrum of the CoCO radical generated by ultraviolet photolysis of $Co(CO)_3NO$ was measured in the millimeter wave region to determine rotational and hyperfine interaction constants. Rotational transitions ranging from $J = 29.5 - 28.5$ to $34.5 - 33.5$ were assigned in the $\Omega = 3/2$ and $\Omega = 5/2$ spin substates of the $X^2\Delta_i$ ground vibronic state as well as in the vibrationally excited states ν_2, ν_3, and $2\nu_2$ of the $\Omega = 5/2$ spin substate. Each rotational transition was split into 8 hyperfine components due to the ^{59}Co nucleus. Molecular constants, including the rotational constant B, centrifugal distortion constant D, nuclear spin-orbit interaction constant a, Fermi contact interaction constant b_F, magnetic dipolar interaction constant c, and nuclear quadrupole interaction constant eQq, were determined for the vibrationally ground state by least squares fitting of the observed spectrum. The equilibrium rotational constant B_e was determined to be 4435.7510(18) MHz and the internuclear distance between Co and C was evaluated to be 1.688 Å. The a and c values are consistent with the values estimated from the hyperfine constants of the ^{59}Co atom. The b_F value is nearly equal to zero.