THE PURE ROTATIONAL SPECTRUM OF $FeCO^+$ ($X^4\Sigma^-$)

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The pure rotational spectrum of the molecular ion $FeCO^+$ ($X^4\Sigma^-$) has been measured using millimeter-wave direct absorption methods incorporating velocity modulation techniques. This work is the first gas-phase study of $FeCO^+$ by any spectroscopic method. $FeCO^+$ was created in an AC glow discharge of gas-phase $Fe(CO)_5$ and argon. Eleven rotational transitions were measured in the frequency range of 323 to 408 GHz. The four fine structure components exhibited very large spin splittings, indicating a high degree of Hund's case (a) character and large second-order spin-orbit interactions. The data has been fit with a case (b) Hamiltonian and rotational and fine structure constants were obtained. $FeCO^+$ may be prevalent in interstellar/circumstellar gas given the large abundance of CO.