FOURIER TRANSFORM MICROWAVE SPECTRUM OF THE FeCN RADICAL ($X^4\Delta_i$) AND CONFIRMATION OF THE GROUND ELECTRONIC STATE

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The pure rotational spectrum of the FeCN radical ($X^4\Delta_i$) has been measured using Fourier transform microwave (FTMW) techniques in the 4 - 40 GHz frequency range and a laser ablation source. The species was produced using Discharge Assisted Laser Ablation Spectroscopy (DALAS) in a supersonic jet expansion of iron vapor and $(CN)_2$, diluted in argon carrier gas. The fundamental rotational transition, J = 9/2 $\rightarrow$ 7/2 (Ω = 7/2), was recorded near 36 GHz. Three hyperfine transitions, due to the nitrogen nuclear spin of I = 1, were observed in the spectrum. These data were combined with the previous millimeter/submillimeter measurements of FeCN in a global fit and nitrogen hyperfine constants were determined. These measurements confirm that the ground state of FeCN is $^4\Delta_i$, as suggested by previous millimeter/submillimeter measurements of Flory & Ziurys. Theoretical calculations have predicted that the ground state of this radical is $^6\Delta_i$. In a $^6\Delta_i$ state, the J = 9/2 $\rightarrow$ 7/2 transition does not exist in the lowest energy ladder (Ω = 9/2).