THE ROTATIONAL SPECTRUM OF CN^-

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CN^- is a unique molecular anion because neutral CN has one of the highest known electron affinities, is observed under a wide range of terrestrial conditions, and because this closed-shell anion is structurally and spectroscopically quite simple, making it amenable to both laboratory detection and high-level quantum chemical calculations. Although CN^- has been studied by photoelectron spectroscopy,[a] no high-resolution spectra have been reported. Here we report the laboratory rotational spectrum of CN^- observed in a low pressure glow discharge through C_2N_2 and N_2. Determination of the rotational and centrifugal distortion constants and the nitrogen quadrupole hyperfine coupling constant allow line frequencies to be calculated well into the far IR. CN^- is an excellent candidate for astronomical detection, because the CN radical is observed in many galactic molecular sources, and calculations[b] indicate CN^- should be detectable in IRC+10216 — the carbon star where C_6H^- has recently been observed. The fairly high concentration of CN^- in our discharge implies that other molecular anions containing the nitrile group may be within reach.

[a] S. E. Bradforth, E. H. Kim, D. W. Arnold, and D. M. Neumark, J. Chem. Phys. **98**, 800 (1993).
[b] S. Petrie, Mon. Not. R. Astron. Soc. **281**, 137 (1996).