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**Title**
Vibration-rotational structures of hydrogen cyanide (HCN) and carbon disulfide (CS2) using high-resolution Fourier transform infrared (FTIR) spectroscopy

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ABSTRACT

The infrared spectra of the linear molecules: hydrogen cyanide (H\textsubscript{12}C\textsubscript{14}N) and carbon disulfide (\textsuperscript{\textsubscript{12}}C\textsubscript{32}S\textsubscript{2}) were recorded and analyzed. A high-resolution Fourier transform infrared (FTIR) spectroscopy was used to obtain the spectrum with a resolution of 0.0063 cm\textsuperscript{-1}. The $\nu_1$ and $\nu_2$ bands of H\textsubscript{12}C\textsubscript{14}N were recorded from a region of wavenumber 3730 cm\textsuperscript{-1} to 3930 cm\textsuperscript{-1} and 620 cm\textsuperscript{-1} to 810 cm\textsuperscript{-1}, respectively whereas the $2\nu_2 + \nu_3$ and $\nu_1 + 2\nu_2 + \nu_3 - \nu_1$ bands of $\textsuperscript{\textsubscript{12}}C\textsubscript{32}S\textsubscript{2}$ were recorded from wavenumber 2275 cm\textsuperscript{-1} to 2380 cm\textsuperscript{-1}. In total, a number of 306 rovibrational transitions were assigned using a non-linear least-square fitting analysis. A set of rotation-vibration energy expression and rotational constants were derived for both polyatomic molecules of H\textsubscript{12}C\textsubscript{14}N and $\textsuperscript{\textsubscript{12}}C\textsubscript{32}S\textsubscript{2}$. The root-mean-square (rms) deviation for the fit was 0.000380 cm\textsuperscript{-1} for $\nu_1$ and $\nu_2$ bands of H\textsubscript{12}C\textsubscript{14}N and the rms deviation of the fit for $2\nu_2 + \nu_3$ and $\nu_1 + 2\nu_2 + \nu_3 - \nu_1$ of $\textsuperscript{\textsubscript{12}}C\textsubscript{32}S\textsubscript{2}$ bands were 0.000341 cm\textsuperscript{-1} and 0.000772 cm\textsuperscript{-1}, respectively. The band centers of the $\nu_1$ and $\nu_2$ bands of H\textsubscript{12}C\textsubscript{14}N were 713.461523 ± 0.000077 cm\textsuperscript{-1} and 3311.475567 ± 0.00011 cm\textsuperscript{-1}, respectively. The band centers for $2\nu_2 + \nu_3$ and $\nu_1 + 2\nu_2 + \nu_3 - \nu_1$ bands of $\textsuperscript{\textsubscript{12}}C\textsubscript{32}S\textsubscript{2}$ were found to be 2324.548988 ± 0.000068 cm\textsuperscript{-1} and 2302.88673 ± 0.00017 cm\textsuperscript{-1}, respectively. The rotational constants for both bands of $\textsuperscript{\textsubscript{12}}C\textsubscript{32}S\textsubscript{2}$ from this work were more accurately determined than those present in the literature.