INFRARED DIODE LASER SPECTRA OF THE CO-Kr VAN DER WAALS COMPLEX: COLD CELL AND FREE JET DATA

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The rotation-vibration spectrum of the weakly-bound complex CO-Kr has been studied in the region of the CO fundamental band (2140 $cm^{-1}$). The CO-Kr spectrum had previously been recorded using a BOMEM Fourier transform infrared spectrometer[a] in conjunction with a cold (84 K) equilibrium cell and a path length of 84 m. The greater sensitivity of the diode laser detection scheme enabled lower partial pressures of Kr and CO to be used in the equilibrium cell; when combined with an increased path length (160 m), this yielded extremely detailed spectra with narrower linewidths, enabling verification of the $K = 1 \leftarrow 0$ and $0 \leftarrow 1$ $Q$ branch assignments from the previous study. In addition, the $K = 2 \leftarrow 1$ and $1 \leftarrow 2$ subbands were readily identified and fitted. The lower resolution and high spectral congestion of the earlier study had prohibited any such assigments. Furthermore, the diode laser spectrum shows evidence of previously unobserved line splittings due to krypton isotope effects.

The same diode laser has also be used in a rapid scanning scheme in conjunction with a pulsed jet source to record the infrared spectrum of rotationally cold CO-Kr. The consequent reduction in spectral complexity enabled unambiguous assignments of low $J$ transitions. The relative advantages and disadvantages of both equilibrium and non-equilibrium methods for the generation of weakly bound complexes demonstrate the complementary nature of the two techniques.

[a] A. R. W. McKellar, J. Mol. Spectrosc. 158, 100 (1993).