HIGH RESOLUTION ROVIBRATIONAL SPECTRA OF FIVE-MEMBERED RINGS WITH HETEROATOMS: NEW RESULTS FROM THE FAR-INFRARED BEAMLINE OF THE CANADIAN LIGHT SOURCE

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The ground state spectra and structures of five-membered ring molecules like pyrrole, furan and thiophene are well established via microwave spectroscopy. Some rotationally-resolved studies of the vibrational bands of these molecules have previously been conducted at high resolution by Fourier transform and infrared diode laser spectroscopy; however, the data obtained via Fourier transform spectroscopy suffers in quality due to the low light flux of conventional light sources (particularly at frequencies lower than 600 cm^{-1}), and due to the requirement that the entrance iris be very small to obtain spectra at high resolution. We report new rotationally-resolved vibrational spectra of five-membered ring molecules using the intense, spatially-confined infrared light produced by the Canadian Light Source synchrotron, which we have coupled into a Bruker IFS125 Fourier transform spectrometer. Spectra of exceptionally high quality were taken at the full resolution of the instrument (0.001 cm^{-1}), both with the synchrotron source (400-700 cm^{-1}) and the internal globar source (700-1000 cm^{-1}). Comparisons of the 400-700 cm^{-1} spectra with those taken with a conventional globar source are given, and analysis of the rotational structure of these bands is presented.