Synchrotron-based study of the far IR spectrum of silacyclobutane

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Rotationally-resolved vibrational spectra of the four-membered ring silacyclobutane (c-C_3H_8Si) from 100-1000 cm^{-1} were collected (resolution: 0.00096 cm^{-1}) using the Bruker IFS125HR spectrometer installed at the far infrared beamline of the Canadian Light Source synchrotron. The vibrational bands observed correspond to motions that are best described as ring puckering (ν_{30}) at 158 cm^{-1}, SiH_2 rock (ν_{29}) at 410 cm^{-1}, ring deformation (ν_{10}) at 543 cm^{-1}, β-CH_2 rock (ν_{28}) at 672 cm^{-1}, α-CH_2 rock (ν_{14}) at 737 cm^{-1} and SiH_2 wag (ν_{22}) at 814 cm^{-1}. Close examination of these bands reveals that each is split into two tunneling components due to ring inversion as recently observed in the microwave spectrum [1]. The ongoing assignment and analysis of the dense patterns of rotation-vibration-inversion transitions in the far infrared region will be presented.

[1] J. van Wijngaarden et al., *J. Phys. Chem. A.* **2011**, *115*, 8650.