WHITE CELL DESIGN FOR FIR FOURIER TRANSFORM SPECTROSCOPY OF TRANSIENT SPECIES

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In order to extend the capability of our Fourier transform spectrometer (Bruker IFS 120HR) we have constructed a White type absorption cell with respect to an optimal use in combination with the FTS in the FIR spectral region.
The optics of the White cell and the transfer optics was optimized with respect to the reduction of diffraction, to the compensation of astigmatism, and minimization of cell volume utilizing a ray tracing program developed at DLR. A maximum absorption path length of 72 m was achieved at 90 passes applying a four row design and a base length of 80 cm. The mechanical set up was designed for cooling of the cell and the mirrors down to 200 K.
Different procedures were employed to evaluate the performance of the White cell at maximum absorption path length. A check in the visible spectral region shows a very good agreement between the observed images on elements of the White cell optics and the prediction by the ray tracing program. From a low-resolution transmittance spectrum in the FIR spectral region the reflectivity of the gold surfaces was calculated and is in good agreement with the published data indicating a very good performance of the White cell. A measurement of CO at high resolution (1/MOPD = 0.0022 cm^{-1}) in the FIR region demonstrates the excellent sensitivity of the Bruker FTS in combination with the White cell. Especially, the profile of measured CO lines shows no asymmetry and indicates a proper alignment of the FTS and no distortion due to the White cell even at high resolution.

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