

The CRAC Atmospheric Simulation Chamber

The atmospheric simulation chamber used for this experiment is made from FEP (fluorine-ethene-propene) foil (4.1m long, 1.1m diameter and 0.127mm thickness) with a volume of 3.91m³. It is operated at 295 ± 2K using purified dry air at 0.1 – 1 mbar above atmospheric pressure. The chamber is equipped with a multiple reflection optical arrangement coupled to an FTIR spectrometer (BioRad Excalibur) for chemical analysis by in-situ spectroscopy. The surface of the FEP foil is inert to chemical attack. The relative humidity and concentration of water in the chamber is noted before each experiment.

The chamber is surrounded by 18 Philips TUV (40 W) lamps with an emission maximum at 254nm and 18 Philips TL05 (40 W) lamps with an emission maximum at 360nm. Between experiments the chamber is cleaned by flushing with the purified air at a flow rate of 0.15 m³ min⁻¹ for a minimum of four hours. The chamber is shown in Figure 6. An in situ multiple-reflection optical system interfaced to a FTIR spectrometer (BioRad Excalibur) was used, which continuously monitored the reaction chamber.

The system consists of a White cell with two circular field mirrors (diameter 254 mm) and a rectangular objective mirror (200 mm x 406 mm manufactured by Lichtenknecker Optics) separated by 3.82 ± 0.01 m. The mirrors are made of Pyrex, gold plated and mounted on adjustable screws to allow for alignment. The FTIR is interfaced to the chamber via a transfer optics arrangement consisting of 12 gold-coated mirrors (Bernard Halle Optics). The beam enters and leaves the chamber through KBr windows (50 mm diameter, 3mm thickness, Moltech, Berlin) and passes through two cut out edges in the objective mirror to give a total optical length of 229.6 ± 0.6 m

The concentrations used in the experiments are specified in the data files.