SULFURYL FLUORIDE: ATMOSPHERIC CHEMISTRY AND GLOBAL WARMING POTENTIAL

Mads P. Sulbaek Andersen*
Department of Chemistry
University of California, Irvine
email: m.s.andersen@uci.edu
http://www.chem.uci.edu/rowlandblake/mpsa.html

Carbon dioxide is the main greenhouse gas (GHG) responsible for the forcing of climate change; however several small, synthetic fluorinated compounds also have the potential to act as strong GHGs once they are emitted to the atmosphere.

Sulfuryl fluoride (SO_2F_2) is a radiatively active industrial chemical released into the atmosphere in significant (ktonne/year) quantities. A substantial amount of SO_2F_2 has been produced since the early 1960s, and it is typically assumed that most of SO_2F_2 is emitted to the atmosphere after use (in fumigation applications). The potential for SO_2F_2 to contribute to radiative forcing of climate change has been assessed. Long path length FTIR/smog chamber techniques were used to investigate the kinetics of the gas-phase reactions of Cl atoms, OH radicals, and O_3 with SO_2F_2, in 700 Torr total pressure of air or N_2 at 296 (± 1 K). The results show that reaction with Cl atoms, OH radicals, or O_3 does not provide an efficient atmospheric removal mechanism for SO_2F_2. The infrared spectrum of SO_2F_2 was recorded and a radiative efficiency of 0.196 W m^{-2} $ppbv^{-1}$ was calculated.

Historic production data estimates are presented which provide an upper limit for expected atmospheric concentrations. The radiative forcing of climate change associated with emissions of SO_2F_2 depends critically on the atmospheric lifetime of SO_2F_2. Other recent studies have found that sulfuryl fluoride has an extended atmospheric lifetime and is likely a strong GHG.