**Infrared Spectra and Radiative Efficiencies of Atmospherically Persistent Perfluoroamines**

F. Bernard[1,2], V.C. Papadimitriou[1,3] and J.B. Burkholder[2]

[1]Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO 80309; 303-497-4819, E-mail: Francois.Bernard@noaa.gov
[2]NOAA Earth System Research Laboratory, Chemical Sciences Division (CSD), Boulder, CO 80305
[3]Laboratory of Photochemistry and Chemical Kinetics, Dept. of Chemistry, U. of Crete, Vassilika Vouton, 71003, Heraklion, Crete, Greece

Perfluoroamines (PFAms) are a class of compounds used primarily in electronic testing and heat transfer applications, which may lead to their release into the atmosphere (e.g. perfluorotributylamine, $N(C_4F_8)_3$, was observed in Toronto (Hong et al., 2013) with an atmospheric mixing ratio of ~0.18 ppt). The atmospheric loss processes of perfluoroamines are presently not well characterized, but they are expected to be atmospherically persistent compounds with lifetimes greater than 500 years. Perfluoroamines are potent greenhouse gases due to their strong infrared absorption in the atmospheric window region. A thorough understanding of the environmental impacts of PFAms necessitates further laboratory studies of the optical and chemical properties of this class of compound.

In this study, the infrared absorption spectra and radiative efficiencies (RE) of a homologous series of aliphatic perfluoroamines, $N(C_XF_{2X+1})_3$ with x = 2-5, were evaluated. Infrared spectra were measured using Fourier transform infrared spectroscopy between 600-4000 $cm^{-1}$ and radiative efficiencies were calculated using estimation methods. The infrared absorption spectra of PFAms have received little attention to date with only the infrared spectrum of $N(C_4F_9)_3$ being reported by Hong et al. (2013) and Godin et al. (2016). The present results are compared with these previous results and trends in the PFAm REs are discussed. Potential atmospheric loss processes of PFAms, atmospheric lifetimes, global warming potentials and future laboratory studies will also be discussed.

Godin, P. J., A. Cabaj, S. Conway, A. C. Hong, K. Le Bris, S. A. Mabury, and K. Strong (2016), Temperature-dependent absorption cross-sections of perfluorotributylamine, J. Mol. Spectrosc., doi:10.1016/j.jms.2015.11.004

Hong, A. C., C. J. Young, M. D. Hurley, T. J. Wallington, and S. A. Mabury (2013), Perfluorotributylamine: A novel long-lived greenhouse gas, Geophys. Res. Lett., 40, 6010-6015, doi:10.1002/2013GL058010.

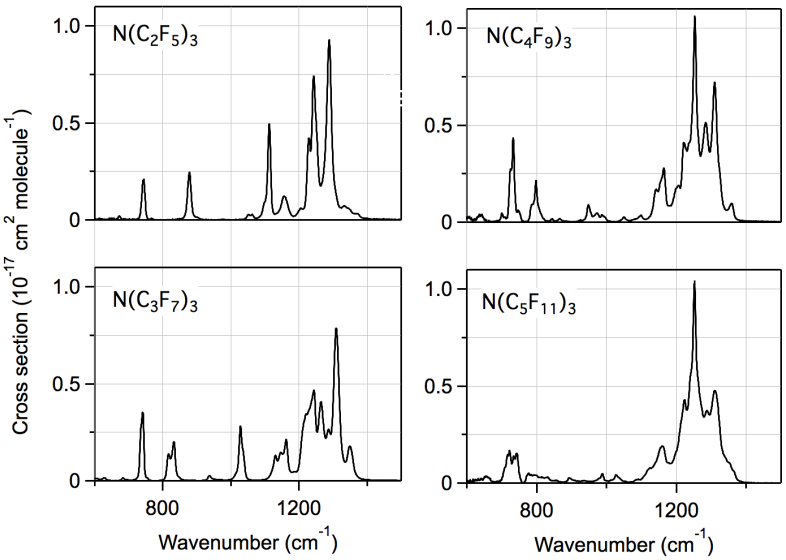


**Figure 1.** Infrared absorption spectra (base e) of several perfluoroamines.