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Laboratory measurements of the infrared absorption cross sections of fluorotelomer alcohols

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Fluorotelomer alcohols (FTOHs, $CF_3(CF_2)_nCH_2CH_2OH$ where n = 0,3,5,7) are industrial chemicals widely used in a variety of industrial products, such as paints, coatings, polymers, adhesives, waxes, polishes, electronic materials, and caulks. Their concentration in the atmosphere over North America has been estimated at 17-135 pg/m^3 with a lifetime from 11 to 20 days. Although the environmental fate of FTOHs is not fully determined, it has been suggested that their atmospheric oxidation is a source of long-chain perfluoroalkyl carboxylic acids (PFCAs, $C_xF_{2x+1}COOH$, where x = 6 - 12) observed in remote locations. To facilitate laboratory studies of the atmospheric chemistry of FTOHs and the spectroscopic detection of FTOHs in the atmosphere, an experimental study of the IR spectra of $C_xF_{2x+1}CH_2CH_2OH$ (x=1,4,6,8) has been performed. We report here on the measurements made at the University of Toronto using samples of pure FTOHs in a 0.25-m-path cell at room temperature over the spectral region 500-4000 cm^{-1} using a Bomem DA8 Fourier transform spectrometer. We show that the FTOHs have absorption cross-sections in the spectral region 1000-1500 cm^{-1} indicating their potential importance as greenhouse gases. These results are shown to be consistent with the measurements done at Ford Research Laboratories using a Mattson Instruments Sirius 100 Fourier transform infrared spectrometer and with theoretical calculations performed at DuPont Engineering Research and Technology.