Cavity-Enhanced Measurements of Hydrogen Peroxide Absorption Cross Sections at Long Wavelengths: Implications for Hydroxyl Radical Production Indoors and Outdoors

Tara F. Kahan¹, Shawn F. Kowal¹, Rebecca A. Washenfelder²,³, Veronica Vaida²,⁴, Steven S. Brown³

¹Department of Chemistry, Syracuse University, Syracuse, New York
²Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, Colorado
³National Oceanic and Atmospheric Administration, Boulder, Colorado
⁴Department of Chemistry and Biochemistry, University of Colorado, Boulder, Colorado

We used incoherent broadband cavity-enhanced absorption spectroscopy (IBBCEAS) to measure hydrogen peroxide (H₂O₂) absorption cross sections between 353 and 410 nm. These measurements expand previously published cross sections by 60 nm. We used these measured cross sections to calculate H₂O₂ photolysis rate constants in the lower troposphere at a range of solar zenith angles. Our results suggest that photolysis at wavelengths longer than those included in the current JPL recommendation may account for up to 28% of hydroxyl radical (OH) production from H₂O₂ photolysis under some conditions. We have also measured photon fluxes from several commonly-used indoor light sources including fluorescent, incandescent, and halogen bulbs, and have calculated OH production rates from H₂O₂ photolysis indoors. We predict that after certain cleaning events, OH production rates will be orders of magnitude greater than under background conditions.