MEASUREMENTS OF PEROXY RADICALS USING CHEMICAL AMPLIFICATION/CAVITY RING-DOWN SPECTROSCOPY

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The peroxy radical chemical amplification (PERCA) method is combined with cavity ring-down spectroscopy (CRDS) to measure peroxy radicals HO_2 and RO_2. HO_2 and RO_2 are converted to NO_2 via reactions with NO, with subsequent reactions to recycle most of the OH and RO coproducts back to HO_2 by reactions with CO and O_2 and amplify the level of NO_2. The amplified NO_2 is then monitored by CRDS, a sensitive absorption technique. The PERCA-CRDS method is calibrated with a HO_2 radical source (0.5-3 ppb); using a 3-meter Teflon tubing as the reactor and 2.5 ppmv NO and 5% vol/vol CO, the PERCA amplification factor or chain length is determined to be 150 +-50 in this study. The peroxy radical detection sensitivity by PERCA-CRDS is approx. 5 pptv/30s. Ambient measurements of the peroxy radicals are carried out at Riverside, California in 2007 to demonstrate the PERCA-CRDS method.