2.025 Applications of total ozone reactivity analyzer to a trial observation in the ambient air and to a further experiment on kinetics of terpene-ozone reactions .

Presenting Author:
Jun Matsumoto, Waseda University, Faculty of Human Sciences, Tokorozawa, Saitama, Japan, jmatsumoto@waseda.jp

Co-Authors:
Shungo Kato, Tokyo Metropolitan University, Hachioji, Tokyo, Japan

Abstract:

Biogenic volatile organic compounds (BVOCs) have been focused on as precursors of tropospheric ozone (O_3) and secondary organic aerosols. Various species of BVOCs have C=C double bonds and can react with O_3. To capture BVOCs comprehensively, a total ozone reactivity (R_{O3}, the sum of k_i[VOC_i]) analyzer has been developed [1-4]. R_{O3} of sample BVOCs can be determined when decrease of O_3 due to BVOCs+O_3 is precisely monitored. In our previous studies, the detection limit of the analyzer reached $2x10^{-5}$ s^{-1} (S/N=3, 60-s average, 50-s reaction) [4]. To demonstrate the validity and usefulness of the analyzer, measurement tests of R_{O3} in the ambient air were conducted in this study. The observation was conducted at a suburban site in Japan (Tokorozawa campus, Waseda University) on July 6 and 7, 2016, and April 30, May 3, July 19, 20 and 21, August 9, 2017. Contribution of ambient NO on R_{O3} was corrected with observed NO concentration and correction factor considered [5]. As a result, R_{O3} was significantly captured when the temperature was high during daytime in summer. It was suggested that observed R_{O3} could be explained roughly by temperature dependence of BVOCs emission from plants. Meanwhile, as another application of the sensitive analyzer, temperature dependence of rate constant, $k(T)$, for gas-phase reactions of BVOCs with ozone were explored experimentally. Consequently, $k(T)$ of beta-caryophyllene+O_3 reaction decreased by 11 % and increased by 9 % when the temperature changed from 299 K to 323 K and to 283 K, respectively.

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