2.154 Measurements of HO2 uptake coefficient on mineral dust particles using aerosol flow tube with PERCA and LIF system.

Early Career Scientist

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Abstract:

Field measurement studies imply that HO_2 uptake on aerosol is one of the most important sinks for HO_2 radicals. The uptake coefficient of HO_2 could significantly affect the budget of OH radicals and ozone regionally. However, the measurement results of HO_2 uptake coefficient on different aerosol are limited, while some have large discrepancies. Laboratory studies were carried out to investigate the heterogeneous reaction of HO_2 radical on TiO_2 and other mineral dust particles using aerosol flow tube (AFT). HO_2 concentrations were measured at room temperature using both peroxy radical chemical amplification (PERCA) system and the Laser-Induced-Fluorescence (LIF) system. For the PERCA system, HO_2 radicals were converted to NO_2, which was measured by a commercial instrument cavity attenuated phase shift (CAPS, Ecotech), in an amplified reactor using a chain reaction involving CO and NO. The amplification factor of HO_2, called chain length (CL), was calibrated at different relative humidity. The detection limit of NO_2 is 0.15 ppbv for an averaging time of 30s. The measurement was conducted under relatively high HO_2 concentration ($[HO_2] = 10^9$ to 10^{10} molecule cm^{-3}). For the LIF system, atmospherically relevant HO_2 concentration was produced ($[HO_2] = 10^8$ to 10^9 molecule cm^{-3}). The detection limit of HO_2 for LIF system is 10^7 molecule cm^{-3}. The measurements of HO_2 uptake coefficient were conducted at relative humidity from 5% to 40% with a time resolution of 30s.