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A modified PeRCA instrument for the selective determination of atmospheric concentrations of HO_2 and RO_2 radicals

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Hydroxyl- and organylperoxyl- radicals, HO_2 and RO_2 respectively, where R refers to an organic chain, play a crucial role in the photo-oxidation processes in the troposphere, in particular in the formation and depletion of tropospheric ozone. They are produced mainly via the oxidation of hydrocarbons and CO by OH radicals.

The peroxy radical chemical amplification (PeRCA) measures the total sum of the HO_2 and RO_2 radicals (RO_2^*=HO_2 + ΣRO_2). It is an indirect technique as RO_2^* is converted and amplified into NO_2 by adding NO and CO to the sampled air at the entrance of the reactor. HO_2 radicals show a greater loss rate in contact with the inlet walls comparing to RO_2, and based on this property a novel reactor to measure solely RO_2 was constructed varying the position of the addition point of NO and CO. Removal efficiency of HO_2 radicals in this new reaction tube will be quantified and presented.

Radical wall losses also depend on the material properties of the surface. Previous work has shown that coating the reactor surfaces with Teflon reduces these losses and increases the sensitivity of the PeRCA technique. Therefore two identical reactors covered by different inert materials (i.e., Teflon and amorphous silicon) will be compared in laboratory experiments focusing on the values of the chain length of the radical amplification. Results of the effect of the coating material in minimizing wall losses will be shown.