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Real-time measurement of reactive oxygen species emitted from indoor particle sources

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Reactive oxygen species (ROS) are considered to be an indicator of particle-induced toxicity. Therefore, measuring particle-bound ROS may be used to assess the harmful effects of inhaling particles. The purpose of this study was to evaluate ROS emitted from sources relevant to indoor exposure.

We use the Particle Into Nitroxide Quencher (PINQ), which measures ROS in real-time (Brown et al., 2019). Real-time assessment of ROS is advantageous for reliable quantification of ROS since many species have short half-lives and cannot be detected by the more common measurement techniques that use filter sampling. Under laboratory conditions, we generated particles from indoor particle sources, including side-stream cigarette smoke, incense, and secondary organic aerosol (SOA) formed from reactions between α-pinene and ozone.

PINQ could detect a clear ROS response from all three indoor sources. The source with the highest total ROS concentration was side-stream cigarette smoke and the lowest incense smoke. High particle concentrations seem to interfere with the fluorescent reading, leading to an underestimation of ROS from the particle phase.

ROS in cigarette smoke and ROS assessment in atmospheric studies are well established and PINQ has been successfully used for these purposes, however, ROS measurements for indoor sources (specifically in real-time) have not been performed so far. The real-time measurements with PINQ can be a powerful tool to quantify the ROS levels from different indoor sources without filter sampling and post-analysis. It could also be utilised for real-time comparisons of ROS indoors and outdoors, helping to understand what drives the toxicity during exposures indoors.

The results of this study provide insight into the ROS formation potential from specific indoor particle types. The lack of similar studies emphasizes the need for further investigation of the toxic effect of particles generated by indoor sources.