Khurshid S, Siegel JA, Kinney KA. 2016. Particulate reactive oxygen species on total suspended particles - Measurements in residences in Austin, Texas. *Indoor Air*, **26(6)**, 953-963.
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Abstract

The biologically relevant characteristics of particulate matter (PM) in homes are important to assessing human health. The concentration of particulate reactive oxygen species (ROS) was assessed in eight homes and was found to be lower inside (mean ± s.e. = 1.59 ± 0.33 nmol/m^3) than outside (2.35 ± 0.57 nmol/m^3). Indoor particulate ROS concentrations were substantial and a major fraction of indoor particulate ROS existed on $PM_{2.5}$ (58 ± 10%), which is important from a health perspective as $PM_{2.5}$ can carry ROS deep into the lungs. No obvious relationships were evident between selected building characteristics and indoor particulate ROS concentrations, but this observation would need to be verified by larger, controlled studies. Controlled experiments conducted at a test house suggest that indoor ozone and terpene concentrations substantially influence indoor particulate ROS concentrations when outdoor ozone concentrations are low, but have a weaker influence on indoor particulate ROS concentrations when outdoor ozone concentrations are high. The combination of substantial indoor concentrations and the time spent indoors suggest that further work is warranted to assess the key parameters that drive indoor particulate ROS concentrations.

Practical Implications

Biologically active chemical species on PM, such as **reactive oxygen species** (**ROS**), may serve as better predictors of health effects associated with PM than PM mass. Understanding indoor particulate ROS concentrations in homes and the factors that drive their concentrations is important because people spend extended periods of time at home and several potential pathways exist for ROS formation indoors. Indoor concentrations of ROS on total suspended particles (TSP) were about **75%** of outdoor concentrations of ROS on TSP in the measured homes which indicates that indoor levels of ROS are only a little lower than outdoor levels. On average, about **58%** of indoor particulate ROS exists on $PM_{2.5}$ which is important to consider in ROS exposure studies. This study contributes toward understanding the **parameters necessary for modeling ROS generation** in real indoor environments.

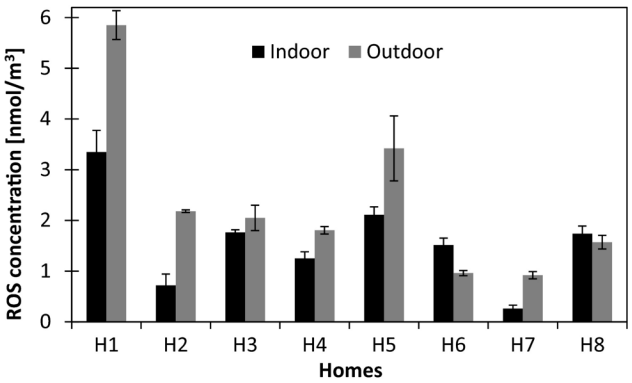

Figure 1. Indoor and outdoor concentrations of ROS on total suspended particles (TSP) sampled at eight residential homes. The error bars represent standard error of triplicate samples.

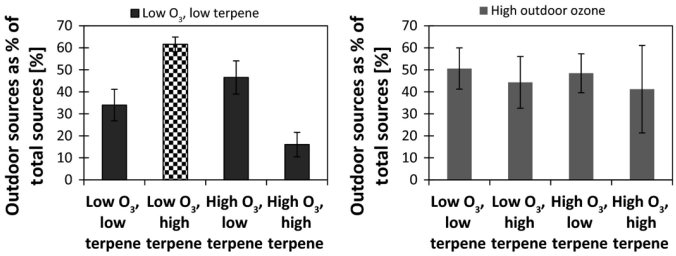

Figure 3. Outdoor sources as a percentage of total (indoor and outdoor) sources of indoor particulate ROS for each indoor condition tested at the UTest House when outdoor ozone concentrations were low (left) and high (right). Data for each condition were collected on three separate days, and means ± standard error are displayed. Statistically significant differences ($P < 0.05$) are marked with matching letters. A particle deposition rate of $\beta = 0.5$/h was used in these source term calculations. All low outdoor ozone sampling days fell in the January sampling period, except for 2 of 3 days for the low O_3/high terpene condition which fell in the July–September sampling period (marked with checker pattern). All high outdoor ozone sampling days fell in the July–September sampling period.

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