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Short communication

Detection of a secondary organic aerosol tracer derived from personal care products

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Abstract

Decamethylcyclopentasiloxane (D_5) is frequently used in personal care products (PCPs). In the gas phase, D_5 is oxidized to form 1-hydroxynonamethylcyclopentasiloxane (D_4TOH), which can partition to the particle phase. Numerous studies have reported secondary organic aerosol (SOA) formation via hydroxyl (OH) radical-initiated oxidation of D_5. It is expected that PCPs have a significant impact on SOA, but the extent has not yet been investigated. To date, no studies have reported the occurrence of PCP-derived SOA in ambient particulate matter. This study examined fine particulate matter ($PM_{2.5}$) collected in Atlanta, GA and Houston, TX and determined D_4TOH was present in 28 of 29 and 33 of 46 ambient $PM_{2.5}$ samples, respectively. Gas chromatographic retention data in the form of the Kováts index is reported for the first time to aid others in identifying this compound in order to assess the impact of PCPs on SOA formation. The estimated concentration of D_4TOH ranged from 16 to 185 pg m^{-3} in Atlanta and 19–206 pg m^{-3} in Houston. Synthetic musks were also detected in Atlanta and Houston $PM_{2.5}$ samples, which is consistent with PCPs impacting urban air quality. Because of its specificity and demonstrated detectability, D_4TOH may be useful as a tracer of PCP-derived secondary organic aerosol.

Graphical abstract