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# Influence of ventilation and room air movement on formation and growth of 1-20 nm particles via ozone-human chemistry

Dusan Licina,[1] Shen Yang,[1] Tatjana Mueller,[2] Nijing Wang,[2] Gabriel Bekö,[3] Meixia Zhang,[1] Marouane Merizak,[1] Pawel Wargocki,[3] Jonathan Williams[2]

[1]Human-Oriented Built Environment Lab, School of Architecture, Civil and Environmental Engineering, École Polytechnique Fédérale de Lausanne (EPFL), 1015 Lausanne, Switzerland

[2]Max Planck Institute for Chemistry, Hahn-Meitner Weg 1, 55128 Mainz, Germany

[3]International Centre for Indoor Environment and Energy, Department of Environmental and Resource Engineering, Technical University of Denmark, 2800 Kongens Lyngby, Denmark

dusan.licina@epfl.ch

Ozone reaction with human surfaces is an important source of ultrafine particles indoors. Our previous study (Yang et al., 2021) was the first to report nanocluster aerosol (NCA, sub-3 nm particles) formation via ozone reaction with humans. However, 1-20 nm particles generated from ozone-human chemistry, which mark the first step of particle formation and growth, remain understudied. Ventilation and indoor air movement could have important implications for these processes. Therefore, in a controlled-climate chamber occupied with human volunteers, we measured ultrafine particles initiated from ozone-human chemistry and their dependence on air change rate (ACR, 0.5 $h^{-1}$, 1.5 $h^{-1}$, and 3 $h^{-1}$) and operation of mixing fans (on and off). Concurrently, we measured volatile organic compounds (VOCs) and explored the correlation between particles and gas-phase products. At 25-30 ppb ozone levels, humans generated 0.2-7.7×$10^{12}$ of 1-3 nm, 0-7.2×$10^{12}$ of 3-10 nm, and 0-1.3×$10^{12}$ of 10-20 nm particles per person-hour depending on ACR and mixing fan operation. Size-dependent particle growth and formation rates increased with higher ACR. The operation of mixing fans suppressed the particle formation and growth owing to enhanced surface deposition of newly-formed particles and their precursors. Correlation analyses revealed complex interactions between particles and VOCs initiated from ozone-human chemistry. The results imply that ventilation and indoor air movement may have a more significant influence on particle dynamics and fate relative to indoor chemistry.

[1] Yang S, Licina D, Weschler CJ, Wang N, Zannoni N, Li M, Vanhanen J, Langer S, Wargocki P, Williams J, Bekö G. *Environmental Science & Technology*, **2021**, *55*(21):14536-45.