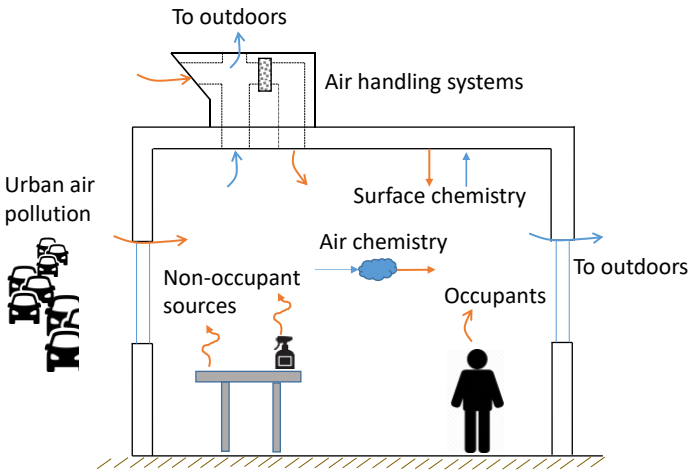
Portland State
Chemistry

College of Liberal Arts and Sciences
Spring 2022 Chemistry Seminar Series
Friday, May 20th

Elliott T. Gall, Ph.D.
Associate Professor, Mechanical and Materials Engineering
Portland State University

Volatile organic compounds in urban buildings: sources, removal, transformation

Abstract There exist diverse sources of volatile organic compounds (VOCs) indoors. In buildings, VOCs can accumulate to levels much greater than outdoors and there exist removal and transformation pathways unique to indoor spaces. For example, air "cleaners" that intentionally emit ions, oxidants, and/or radicals into the indoor environment are becoming increasingly commonplace. The PSU Healthy Building Research Lab has conducted a series of lab and field studies to investigate the sources, transformation, and removal processes that govern indoor VOC levels and products of indoor VOC chemistry. First, we report on an intensive air monitoring campaign conducted in an occupied middle school. Using mass-balance principles to characterize whole-building airflows and high time resolution measurement of VOCs, we apportion indoor VOC source strength, estimate per-person and area emission factors, and calculate the removal efficiency of air cleaning systems. Next, we discuss results of controlled chamber and field studies that investigate the impact of air cleaning systems on levels of VOCs and emitted byproducts. Finally we report chamber study results that show demanding cognitive tasks increase human VOC emission rates. This unique study presents the potential need for considering occupant cognitive task when setting building ventilation rates.



Biography Dr. Elliott Gall is an associate professor at Portland State University in the department of Mechanical and Materials Engineering. He received his B.S.E. in Environmental Engineering from the University of Florida and his Ph.D. in Civil Engineering from the University of Texas at Austin. Dr. Gall's research and teaching seeks to develop healthy buildings by studying the physical and chemical processes that govern our exposure to indoor air pollution. Current projects aim to develop methods

for applying proton transfer reaction – time of flight – mass spectrometry to the study of indoor air pollution dynamics. A current focus is the measurement of indoor source, sink, and transformation processes related to traffic related air pollution, indoor surfaces, and air-cleaning systems in field studies. He has authored over 40 peer-reviewed journal publications and was acknowledged with the 2018 Yaglou Award from the International Society for Indoor Air Quality and Climate for his work on indoor ozone chemistry. His work at Portland State has been featured in national and local media, including The Atlantic, National Geographic, and The Seattle Times. He occasionally tweets about research and other topics @etgall.