

**ABSTRACT/PRESENTATION:
AMERICAN ASSOCIATION FOR AEROSOL RESEARCH
VIRTUAL
OCTOBER 2020**

Particle and Chemical Emissions from Fused Filament Fabrication 3D Printers Using Emerging Filaments Including Metals

Dr. Qian Zhang, Underwriters Laboratories Inc.

Dr. Marilyn S. Black, Underwriters Laboratories Inc.

Dr. Rodney J. Weber, Georgia Institute of Technology

**Corresponding email: rweber@eas.gatech.edu*

ABSTRACT

Studies have shown that fused filament fabrication (FFF) 3D printers that are widely used by the general public emit high levels of ultrafine and fine particles, as well as numerous volatile organic compounds (VOCs). Research has found the emission characteristics depend on print conditions like extrusion temperature, print material, printer and filament brands. As more new materials and filaments are becoming available in the market, this study aims at characterizing particle and VOC emissions from emerging filaments and comparing to previously studied ones to understand which print conditions are mostly linked to emissions. We measured particle and VOC emissions from multiple FFF 3D printers and filaments using an established standardized testing method in a specialized exposure chamber. The studied new filaments include thermoplastics, metals, and mixture of thermoplastics with metals, flame retardants, or carbon fibers. Particle concentration and size, and concentration and composition of VOCs emitted as a function of filament material, extrusion nozzle temperature and filament additives are investigated. Metal composition of emitted particles and raw filament materials will also be analyzed, and the potential health impacts associated with particles, metals and VOCs will be discussed.