

Characteristics of particulate matters emissions from a 3D printer

Chen Jia En¹, Ching-Huang Lai¹, Yi-Fong Tsai²

¹School of Public Health, National Defence Medical Center, Taipei, Taiwan, R.O.C.

²Joint Center for Instruments and Researches, College of Bioresources and Agriculture, National Taiwan University.

Category: Others

Nowadays, the development of 3D printing technique is changing the tradition manufacture system. Three-dimensional (3D) printers recently is widely used for rapid prototyping and small-scale fabricating in office and home. However, as the 3D printer commonly used indoors, hazardous particular matter (PM) emissions were not noticed by the users. To our knowledge, only few studies discuss the ultrafine particles (UPFs), volatile organic compounds (VOCs), and PM_{2.5} emissions simultaneously from 3D printers.

This study evaluated the emissions characteristics of hazardous material during fused deposition modeling (FDM) type of 3D printing. The commercially available 3D printer (UP plus 2), which is capable of testing ABS, PLA, HIPS plastic used in all experiments. Six different commonly used filaments with 1.75 mm diameters (three ABS, two PLA and one HIPS cartridges.) were used as materials in the experiment and each test was repeated at least three times. All measurement and operation were conducted in the enclosed chamber system. The results displayed the particle concentration of 3D printing using ABS and HIPS materials were 10 times higher than that of PLA materials and the particle matter distributions were different from different filament companies. Furthermore, the particle sizes of the particulate matter emissions from the 3D printer were between 1 μm and 2 μm diameters. We suggest the 3D printer users should improve the ventilation and other engineering control for hazards during the operating process.