Supplementary Information

Characteristics of Nanoparticle Formation and Hazardous Air Pollutants
Emitted by 3D Printer Operations: from Emission to Inhalation

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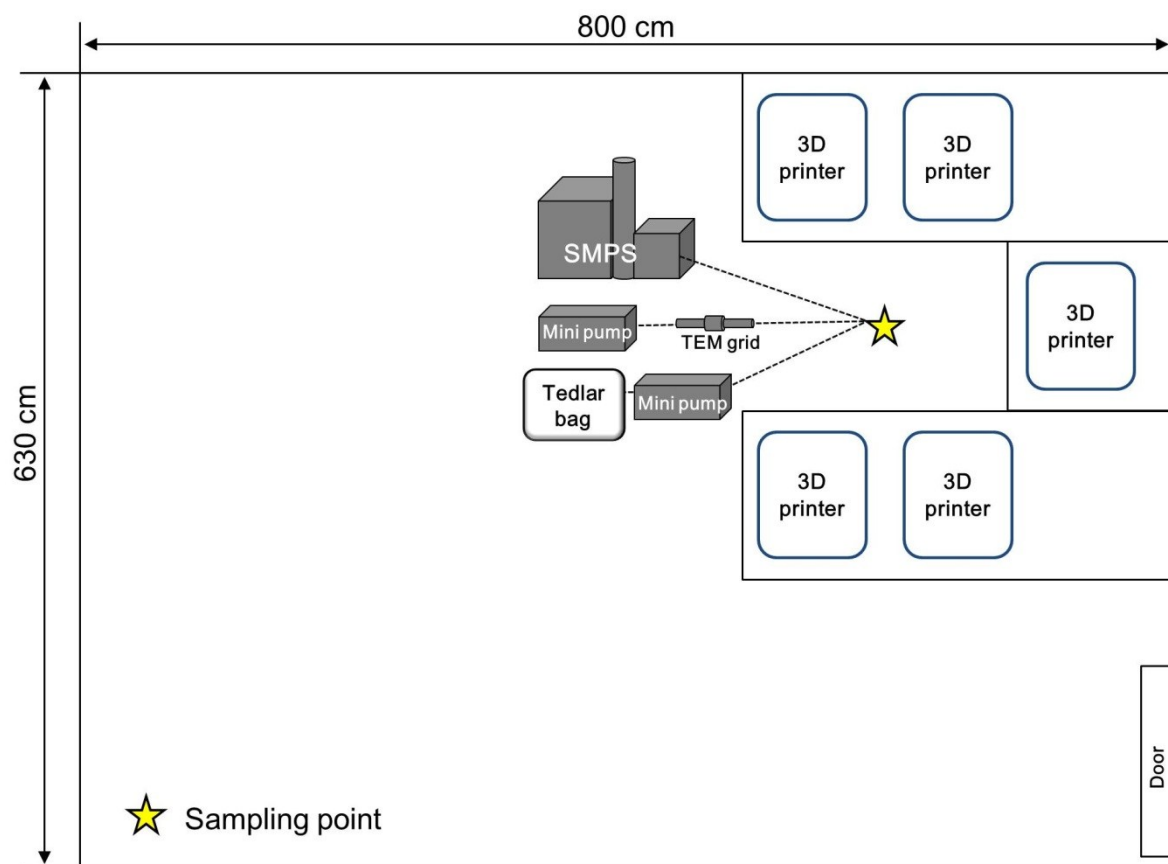
S1. Room layout:

Fig. S1. Room layout and experimental setup.

S2. MPPD model parameters:

Table S1. MPPD model input parameters

Parameter	
Lung model	Yeh/Schum symmetric
Airway flow	Uniform
Function residual capacity (ml)	3300
Upper respiratory tract volume (ml)	50
Particle density (g cm^{-3})	1
Diameter (nm)	10.9 - 372
Acceleration of gravity (cm s^{-2})	981
Breathing scenario	Oronasal-mouth breather
Breathing frequency (min^{-1})	12
Tidal volume (cm^3)	625

S3. Airway generation surface area

Table S2.

Airway generation number	Surface area (cm2)
1	6.074
2	22.94
3	16.51
4	23.64
5	33.78
6	39.62
7	52.81
8	80.15
9	98.72
10	137
11	169.7
12	212
13	264.5
14	346.6
15	454.3
16	673.4
17	1045
18	1673
19	2785
20	4190
21	6015
22	7829
23	9373
24	10640
25	10880
26	9692
27	8270
28	6657

S4. HAPs species concentrations:

Table S3

Species	Concentrations (ppb)	Health Effects
Acrylonitrile	3.36	Carcinogen (Group 2B)
Methylene chloride	1.64	Carcinogen (Group 2A)
Hexane	8.46	CNS effect
Chloroform	0.32	Carcinogen (Group 2B)
Benzene	0.52	Carcinogen (Group 1)
Trichloroethylene	0.09	Carcinogen (Group 1)
Toluene	1.65	CNS effect
Tetrachloroethylene	0.02	Carcinogen (Group 2A)
Chlorobenzene	0.16	Narcosis, tremors, and muscle disorder
Xylene	1.28	CNS effect
Styrene	0.33	Carcinogen (Group 2A)
1.4-Dichlorobenzene	0.30	Severe irritation to the eyes, skin, and throat
1.2.4-Trichlorobenzene	0.26	CNS effect
Hexachloro 1.3-butadiene	0.27	Cardiac disease, disturbances of nervous function

Groups of carcinogen classified by the IARC monographs

- Group 1: Carcinogenic to human (120 agents)

- Group 2A: probably carcinogenic to human (82 agents)

- Group 2B: Possibly carcinogenic to human (311 agents)

- Group 3: Not classifiable as to its carcinogenicity to human (499 agents)

- Group 4: Probably not carcinogenic to humans (1 agent)

References

International Agency for Research on Cancer Website: https://monographs.iarc.fr/list-of-classifications-volumes/

Toxicology Data Network Website: https://toxnet.nlm.nih.gov/index.html