Supporting Information

This section includes a table summarizing the percentages of individual VOC concentrations from each printer component heated in a furnace, as well as the method used to calculate the maximum reaction rates between ozone and particles during printing.

Calculation method of the maximum reaction rates between ozone and particles

In the case of a chemical reaction between the suspending gas and a particle, there are three mass transfer steps: (1) the diffusion of specific gas molecules to the surface of the particle, (2) the transfer across the interface or reaction at the interface and (3) the diffusion into the solid or liquid particle. Any of the three steps may control the rate of reaction (*1*). When the size of a particle is less than the mean free path, the reaction is controlled by the rate of random molecular collisions between the particle and the vapour molecules (*2*). In this study, the mean free path of ozone was > 4 cm which is far more than the particle size. Therefore, the rate of arrival of ozone molecules to the entire particle surface is given by (*2*):

$$R_R = \frac{\pi d_p^2 p_\infty}{\sqrt{2\pi mkT}}$$

Where d_p is the particle size, p_∞ is the ambient partial pressure of vapour, m is the mass of a vapour molecule and k is Boltzmann's constant.

Assuming every collision between ozone molecules and particles will trigger a reaction, R_R is the maximum rate of reaction. Calculation has been done for two cases in our experiment: (1) T = 300 K, [O3] = 500 ppb, d_p = 62 nm; (2) T = 300 K, [O3] = 1000 ppb, d_p = 106 nm. The results indicate that the maximum reaction rates between ozone and the generated particles are 1.34×10^7 and 7.84×10^7 molecules.s^{-1} for the case 1 and 2, respectively.

Reference:

(1) Baron, P.A.; Willeke, K., eds. *Aerosol Measurement: Principles, Techniques, and Applications (Second Edition)*. 2001, Wiley-Interscience.

(2) Hinds, W.C. Aerosol Technology: Properties. *Behavior, and Measurement of airborne Particles (2nd)*, **1999**.

Table S1 Percentages of individual VOC concentrations in the test chamber emitted from paper (PA), fuser roller (FR), toner powder (TP) and Lubricant oil (LO) heated in a furnace (unit: %).

Compounds	Function groups	PA	FR	TP	LO
Furfuryl alcohol *(T)*	Alcohols	2.0			
Dodecenal *(D)*	Aldehydes	3.7			
2-Furaldehyde	Aldehydes	1.7			
trans-2-Decenal (D)	Aldehydes	7.0			
Pentanal	Aldehydes	2.4			
Propanal (P)	Aldehydes	2.3			
Heptadecane	Aliphatic	1.8			
2,6-Di-tert.butyl-4-methylphenol (B)	Aromatics	3.8			
2,6-Di-tert-butyl-p-benzoquinone (B)	Aromatics	1.2			
BHT-Quinone Methide	Aromatics	0.3			
Dibutylphthalate	Carboxylic esters	20.4			
2,3-Butanedione (T)	Ketones	0.7			
Nitrogenous (T)	N-containing	0.9			
Butylglycol	Alcohols		1.5		
Tetradecane	Aliphatic		2.6		
Naphtalenederivate (T)	Aromatics		3.7		
1,3,5-tribromo-Benzene (T)	Aromatics		2.4		
Naphthalene	Aromatics		2.0		
N-Methyl-2-pyrrolidone	N-containing		7.8		
Benzaldehyde	Aldehydes			35.0	
2-methyl-Benzaldehyde (T)	Aldehydes			0.6	
2-Phenylpropenal (T)	Aldehydes			13.7	
iso-Pentane (H)	Aliphatic			0.8	
3-Butene-2-one (M)	Alkenes			3.1	
Isocyanato-Benzene (T)	Aromatics			1.6	
Benzene	Aromatics			1.2	
Diphenylpropan (T)	Aromatics			0.8	
alpha-Methylstyrene (T)	Aromatics			0.7	
1-phenyl-1-Propanone (T)	Aromatics			0.6	
Benzyl alcohol	Aromatics			0.6	
Butanoic acid (HA)	Carboxylic acids			1.3	
5-chloro-1H-Benzotriazole (T)	N-containing			0.8	
C13-Benzen (T)	Aromatics				10.4
Hexamethyl-cyclotrisiloxane	Siloxanes				1.6
n-Heptanal	Aldehydes	6.6		1.2	
n-Nonanal	Aldehydes	16.5			
Octanal	Aldehydes	7.7			
n-Hexanal	Aldehydes	7.6		0.9	
Butanal	Aldehydes	2.8		2.2	
Heptane	Aliphatic				5.5
Hexadecane	Aliphatic	0.9	2.4		
Squalene	Alkenes	7.4		5.8	
BHT-Derivate (T)	Aromatics	0.7	1.1		
2,6-Diisopropylnaphthalene	Aromatics	0.3	0.4		
Styrene	Aromatics		0.7	1.6	
Phenol	Aromatics		64.9	2.7	
Acetophenone	Aromatics		5.9	22.9	
Toluene	Aromatics			1.3	
Carboxylic ester (T)	Carboxylic esters			0.5	6.6
2,2,4-Trimethylpentane-1,3-diol-monoisobutyrate (TE)	Carboxylic esters		4.3		
Sulfinylbis-methane (T)	Sulfide	1.2			76.0

Note: The proportion of VOC species emitted by each printer component was determined by dividing the total concentration of identified VOC species by the concentration of individual VOC. The

reference substances used are stated in the parentheses. (T): Toluene; (D): n-Decanal; (P): Pentanal; (B): BHT; (H): Hexane; (M): 2-Butanone (MEK); (HA): Hexanoic acid; (TE): Texanol.