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Comparative characteristics of relative pollution exposure caused by human surface chemical reaction under mixing and displacement ventilation

Jun Wang, Jie Yang, Jiang Yu, Feng Xiong



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1 **Comparative characteristics of relative pollution exposure caused by human surface**
2 **chemical reaction under mixing and displacement ventilation**

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4 Jun Wang*, Jie Yang, Jiang Yu, Feng Xiong

5 *College of Architecture and Environment, Sichuan University, Chengdu 610065, China*

6 *Corresponding author: wangjunhvac@163.com

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8 **Abstract:** The purpose of this present study is comparing the characteristics or difference of
9 relative pollution exposure induced by human surface chemical reaction, as to the conditions of
10 mixing and displacement ventilation. In order to comprehensively evaluate impacts extent and
11 relative importance of chemical reaction and ventilation on pollution exposure, the evaluating
12 method of relative pollution exposure was given. As to human surface chemical reaction between
13 ozone and squalene and the authors' previous research of reference [1], influence of air change rate,
14 reactants concentration and chemical reaction rate on the ozone and product concentration in
15 breathing zone and relative pollution exposure (ozone and product concentration ratios between
16 breathing zone to bulk air) were analyzed for these two kinds of ventilation. The results indicate
17 that the maximum variation range of ozone concentration ratio is from 0.92 to 0.98 under mixing
18 ventilation and 0.93 to 0.98 for displacement ventilation. Meanwhile, those of product
19 concentration ratio are from 1.54 to 2.00 and 1.12 to 1.69 for mixing and displacement ventilation,
20 respectively. The variation of ozone and product concentration in breathing zone behaves more
21 distinct features for displacement ventilation. However, mixing ventilation brings slightly greater
22 influence on ozone and product concentration ratios. For ventilation system design and controlling
23 the relative pollution exposure induced by human surface chemical reaction, high ACH and
24 lowering ozone concentration in supplied air and squalene concentration and chemical reaction
25 rate in human surface is very conducive and necessary.

26 **Keywords:** chemical reaction; human surface; relative pollution exposure; mixing ventilation;
27 displacement ventilation

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29 **1. Introduction**

30 As one typical indoor chemistry, ozone (O₃) reaction with indoor human surface (skin, hair,

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