

PA28) Evaluation on Deodorization Efficiencies of Smoked Shirts by Steam-blowing

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1. Introduction

In the Korea having odorous foodstuff cultures, odors from tobacco smokes, Kimchi, and Bulgogi(roast beef), which Koreans had not felt as odors, become ones as population of the residents has increased in tall buildings and apartments which are highly enclosed. Though washing machines become to be computerized and more intelligent, even now we cannot have enough time to wash our clothes sufficiently. It has been known that odors from odorous foods or tobacco-smokes attached to the clothes could be felt when being slipped on next morning. In this study, deodorization effects of tobacco-smoked shirts by steam blowing in washing machines were investigated and variations of concentrations of odorants emitted from the shirts were observed.

2. Experimental

2.1. Preparation of tobacco-smoked shirts

Y shirts for adults made from 75% cotton and 20%polyester were deodorized by standing for 1 hour in a drying oven at 150°C and then 4 among them were hung in a 1 m³ box covered with 35 μ m polyester film. On the bottom of the box, cigarettes (Trademark is Raison made in Korea) was put and smoked for 20 minutes. The air in the box was circulated with an electric circulating fan. Two pieces of cigarettewere used for sensory assessment and 5 pieces for GC/MS analysis. One of 4 shirts in the box was taken out and hung in a room at room temperature for 5 minutes and put in a 10-liters polyester bag, and two of them were put in a washing machine (5 kinds of drum washing machine, WD-1577FD, TD, ND, RD, AD) and steamed. One of steamed shirts was put into a sampling bag and the other was hung in the room for 40 minutes and put into another sampling bag. Each sampling bag was charged with 5 liters of VOC free nitrogen gas for sensory assessment and GC/MS analysis.

2.2. Sensory assessment on dorous shirts and GC/MS analysis of odorants

Olfactory assessmentwas carried out by 6 panelists who passed the olfactory test based on the Japanese official standard method for odor concentration. For GC/MS anal-

ysis, volatile organic compounds (VOCs) were adsorbed on Tenax TA tube from 3 liters of nitrogen in sample bags. The concentrated VOCs in Tenax tube were thermally desorbed and subsequently analyzed with GC/MS (ATD-GC/MS : HP5890, Perkin Elmer).

3. Results and Discussion

3.1. Odor removal efficiencies by odor strengths and concentrations

Removal efficiencies of tobacco-smoked odor were evaluated every twice for 5 different type of washing machines. Fig. 1 showed that odor strength of the shirts hung for 20 minutes after steaming was lower than that of the shirts hung 40 minutes without steam. And Fig. 2 showed that odor removal efficiencies calculated with odor concentrations was ca. 94% to the shirts hung for 20 minutes after steaming but only 56% to those hung for 40 minutes without steaming.

3.2. VOCs decrease by GC/MS analysis

Fig. 3 showed the reductions of total concentration of VOCs emitted from the smoked shirts analyzed by gas chromatograph coupled with mass detector. VOC removal efficiencies obtained from TVOC concentrations indicated average 24% for the shirts of 40 minutes without steaming and average 48% for those of 20 minutes after steaming. It means that steaming diminish the VOCs from shirts twice than without steaming. The odorants attributing to odors from shirts analyzed by GC/MS were affirmed as methyl

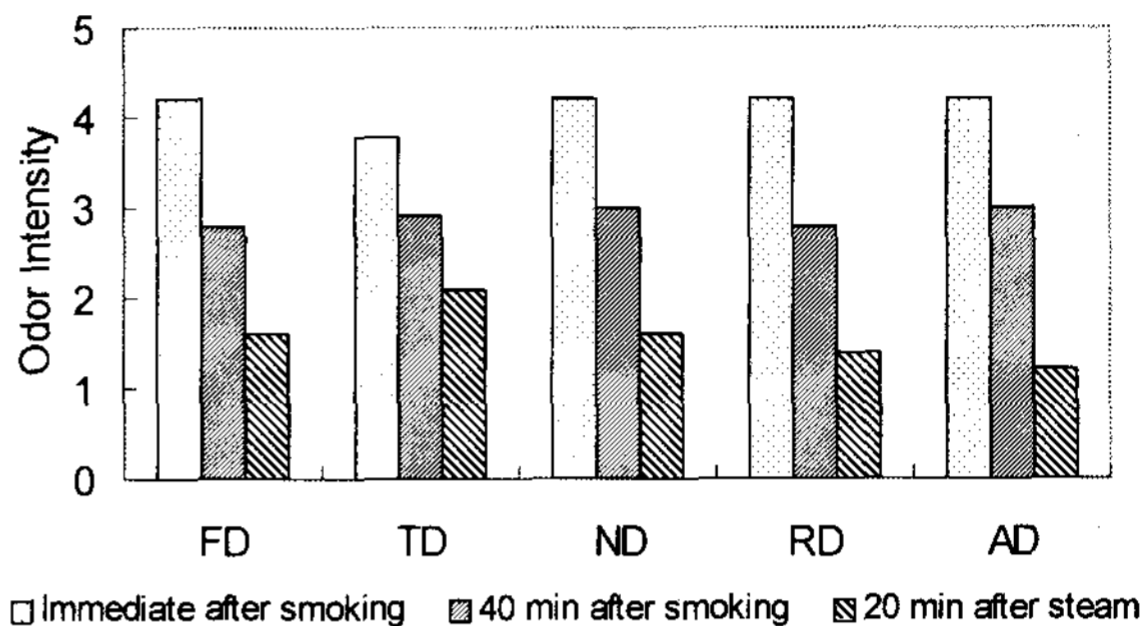


Fig. 1. Odor intensity of tobacco-smoked shirts

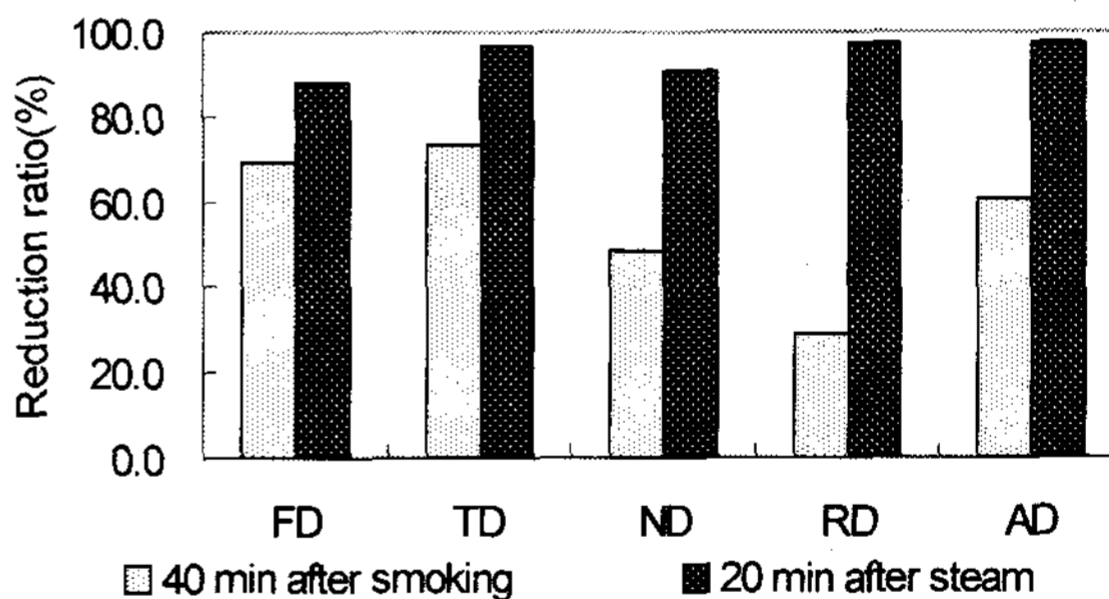


Fig. 2. Odor concentration of tobacco-smoked shirts

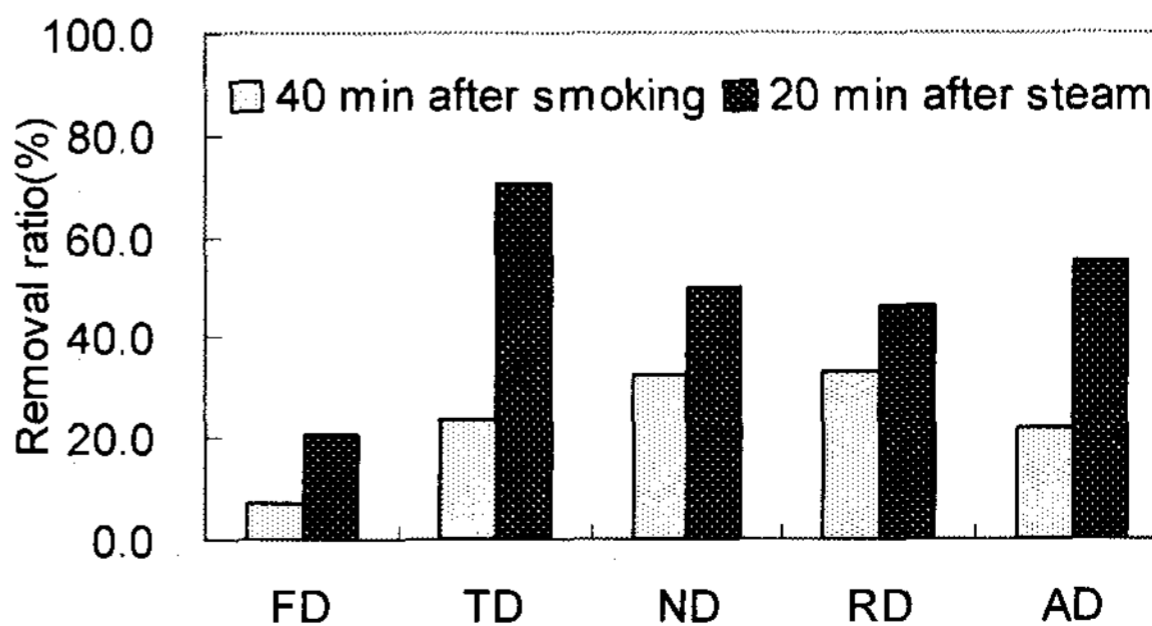


Fig. 3 Removal ratio of TVOC for smoked shirt

ethyl ketone, valeraldehyde, pyrazine, pyrrole, benzaldehyde and so on. And these compounds were confirmed to decrease in ca. 63% by hanging for 40 minutes without steaming and in ca. 90% for 20 minutes with steaming.

References

- 1) Hiroyuki MORIKITA, 2005. Component analysis of cigarette adhesion odor, 18th Annual Conference on Odor Environment, 55~57.