

A Comparison of Nicotine Diffusive Sampler and XAD-4 Tube for Determination of Nicotine in ETS

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Abstract

Active sampler has been widely used to measure nicotine concentration in air. The experiments were conducted to compare the active sampler method with diffusive sampler in exposure chamber and smoking areas, respectively. The result of these tests that indicated that passive sampler can be used instead of active sampler in ETS, because coefficient of determination was 0.9292 between active and passive sampling in smoking area

Introduction

It is widely known that Environmental Tobacco Smoke(ETS) is not good for health. ETS is composed of a lot of chemicals. So indicators are needed to evaluate the risk of ETS in air. One of the indicators is Nicotine. It is so difficult to evaluate the exposure of Nicotine of ETS with active sampling for long time sampling. So the small passive sampler that doesn't need to be charged electronically was developed. The purpose of this study is validation of passive sampler in chamber and smoking area to evaluate the non-smoker exposure of ETS

Materials and Method

GC 5890 with Nitrogen Phosphorous Detector was used to analyze Nicotine quantitatively with internal standard quinoline. Ethyl Acetate and Heptane were used to extract nicotine from XAD-4 and Nucleopore Polycarbonate filters respectively.

1) active and passive sampling in the chamber

The nicotine was generated in chamber (0.68m×0.68m×0.68m) using a tobacco ('THIS', KT&G). Ventilation rate was 2~3ACH. XAD-4 tube(active sampling) and Nucleopore Polycarbonate filters(passive sampling) coated with NaHSO₄ were used.

2) active and passive sampling in the smoking area

The sampling was conducted in office and smoking room/area. Active and passive sampling were located side by side.

Results and Discussion

Sampling rate was 40.5 mL/min in exposure chamber. Experimental sampling rate(40.5 mL/min) was higher than theoretical sampling rate(33.52 mL/min). And the higher was the concentration in air, the more was the gap between experimental sampling rate and theoretical sampling rate.

The average(GM) concentrations of nicotine by two sampling methods were 8.29 $\mu\text{g}/\text{m}^3$ (active sampler), 7.54 $\mu\text{g}/\text{m}^3$ (passive sampler) in smoking area. There was little regression between active sampler and passive sampler($R^2=0.2397$). But slope, coefficient of determination was 1.017, 0.9292, respectively after removing outliers. And the slope(1.017) was close to the theoretical slope(1).

Conclusion

We compared passive sampling with active sampling. The result of this study indicated that diffusive sampler can be used to evaluate concentration in ETS instead of active sampler even though the passive sampler can underestimate the concentration of nicotine in ETS

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