**Determination of polycyclic aromatic hydrocarbons in body and smoke of cigarette**

Haruki Shimazu

3-4-1 Kowakae, Higashiosaka, Osaka 577-8502, Japan, [hshimazu@civileng.kindai.ac.jp](mailto:hshimazu@civileng.kindai.ac.jp)

Polycyclic aromatic hydrocarbons (PAHs) have been observed in various environments because they are produced primarily as a result of incomplete combustion from anthropogenic sources such as cars, incinerators, and factories. Some countries have regulated PAHs because some of them are considered to be mutagenic and carcinogenic. However, little is known about occurrence and emission characteristics of PAHs for cigarette. In order to contribute to development of the risk assessment for PAHs in indoor environments, this study examines the occurrence of PAHs in body and smoke of cigarette.

Nine PAHs were determined in sidestream smokes for five kinds of cigarettes. The volume of the experimental room is approximately 66 m3. The air samples were collected at the rate of 400L/min for 2.75 hrs before and after the cigarettes were burned. PAHs in the samples were collected on the glass fiber filter and extracted with dichloromethane by ultrasonic extraction. After cleanup, the extract is concentrated to with rotary evaporator and nitrogen gas flow. PAHs in the extracts were measured with GC/MS.

Seven PAHs were detected in indoor air samples before the cigarettes were burned. Fluoranthene (FL) and pyrene (PY) were detected in almost all samples. The total concentration levels of the PAHs were approximately 1.0 ng m-3. On the other hand, nine PAHs were detected after the cigarettes were burned. Benzo[a]anthracene (BaA), benzo[a]pyrene (BaP), benzo[b]fluoranthene (BbF), benzo[ghi]perylene (BghiP), FL and PY were detected in all samples. The median concentration and the range for the total of the nine PAHs were 29.1 ng m-3 and from 7.6 to 57.6 ng m-3, respectively. The PAH emission is estimated to be 0.22 to 1.87 μg per one cigarette. The correlation coefficients between the detected PAHs were significantly positive, probably because that the detected PAHs are formed from the same precursor. The median concentration of suspended particulate matter (SPM) after cigarette combustion was 0.117 mg m-3, seven times higher than that of SPM before cigarette combustion. The relationship between SPM and the total of the nine PAHs in air samples after cigarette combustion is slightly proportional. This may indicate that the SPM formation is associated with the PAH formation in sidestream smoke.

Furthermore, nine PAHs were determined in cigarette bodies before and after the cigarettes were burned. The cigarette consists of filter and leaves wrapped with paper. The filters and the leaves were analyzed. Each of the samples was put into a cellulose extraction thimble and extracted with dichloromethane by ultranic extraction. The range of contents for the total of nine PAHs in the five kinds of cigarette bodies before combustion was from 293 to 848 ng per one cigarette. The range of those after combustion was from 67 to 266 ng per one cigarette. This indicates that almost all PAHs were generated during the cigarette combustion and emitted to the air.