

機車族行車時單苯環碳氫化合物暴露之研究

Monocyclic Aromatic Hydrocarbons Exposure of Motorcyclists

中文摘要

機車為一開放性駕駛環境之交通工具，騎乘者直接暴露於周遭空氣中各類氣態污染物質，由於騎乘機車的族群龐大，有必探討機車族在各種行車環境空氣中的污染暴露情形。本研究以固體吸附劑-熱脫附-氣相層析法(Solid Sorbent-Thermal Desorption-Gas Chromatography)採樣分析台北市機車族行駛環境空氣中十種與汽油燃燒、溢散相關的單苯環碳氫化合物(Monocyclic aromatic hydrocarbons, MAHs)濃度。採樣人員配帶填充固體吸附劑的吸附管搭配採樣幫浦，實際騎乘機車行走於台北市某固定路段上，採取空氣中的單苯環碳氫化合物送回實驗室分析，為與台灣地區之背景值比較，本研究同時採集郊區樣本。

採樣於工作日不同時段重複進行，以瞭解每日不同時段單苯環碳氫化合物濃度的變化情況。可能影響污染物濃度的相關環境變數如道路狀況、行車時間、風速、相對溼度、溫度、大氣壓力等同時測量並記錄。採樣期間為 1999 年 3 月至 5 月間，共採得 156 組樣本。

採樣與分析結果顯示，台北市機車族上下班時段的苯與甲苯濃度與 1991 年時的數據並無顯著差異；與國外自行車族上下班時段苯與甲苯的平均濃度比較，國內機車族上下班時段濃度高出 14~34 倍與 15~65 倍。

國內郊區道路 MAHs 濃度與國外郊區道路濃度相比並無顯著差異。比較相同種類 MAHs 的濃度，所有的郊區道路 MAHs 樣本值均低於任一市區道路樣本，前者最低濃度值約為後者最低濃度值的 6.6%。顯示國內都市道路空氣污染問題嚴重，而偏遠郊區空氣仍然新鮮。

機車族上班時段、下班時段、第二下班時段、次尖峰時段、白天非尖峰時段、午夜清晨時段的 MAHs 濃度比值約為 6 : 5.9 : 4.1 : 3.1 : 2.3 : 1。除暴露濃度差異外，同樣路程的行車時間亦有時段差異，綜合暴露濃度及時間的暴露量比值則約為 10.3 : 10.5 : 5.6 : 4.7 : 3.3 : 1。

最後，本研究之污染物濃度與各項氣象條件之相關性除風速與 MAHs 濃度呈現負相關趨勢，溫度、氣壓及相對溼度的相關性則不明顯。

英文摘要

Motorcycle is a kind of open vehicles. Motorcyclists expose to air pollutants more than those people who choose other traffic patterns. In Taiwan, motorcycles are the most common vehicles. It is important to approach air pollutants exposure of motorcyclists in different riding conditions. This study measured the in-riding concentrations of 10 gasoline-related monocyclic aromatic hydrocarbons(MAHs) by the Solid Sorbent-Thermal Desorption-Gas Chromatography Method. Motorcyclist

with personal sampler was riding in one section of main street of Taipei. Samples were transferred to the laboratory and were analyzed within one week. The countryside air was also sampled and analyzed during the study period for comparison.

Sampling was performed at different time period of workdays to measure the variation of MAHs concentrations . Factors such as different traffic patterns, sampling time, wind speed, relative humidity, temperature, and atmospheric pressure, were evaluated. A total of 156 samples was collected from March to May of 1999.

The benzene and toluene concentrations did not change when data were compared of the results obtained from 1991. Compared with foreign studies, the concentrations of benzene and toluene are 14~34 and 15~65 times higher.

However, there was no significant difference between our results and foreign studies in MAHs exposure concentration when the exposure of country riders were investigated. The concentrations of 10 MAHs sampled from countryside were significantly lower than Taipei metropolitan samples. The lowest concentration in rural sample was only 6.6% of the lowest city sample.

The concentration ratios of MAHs between 8:00~9:00, 17:00~18:00, 21:00~23:00, 15:00~17:00 and 18:00~19:00, 23:00~6:00,were 6: 5.9: 4.1: 3.1: 2.3: 1. The time spent for riding the same distance varied during different time periods. By weighting both concentrations and duration of exposure , the ratios of MAHs exposure dose were 10.3 : 10.5 : 5.6 : 4.7 : 3.3 : 1.

Only the wind speed showed negative association when the relationship of MAHs concentrations and meteorological factors were considered. Other factors, such as humidity , temperature and atmospheric pressure existed no correlation with pollutants concentrations.