

Study on Distribution of Polycyclic Aromatic Hydrocarbons in Da Nang, Vietnam and Examination of their Adsorption Characteristics on Soil

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1. Background and Objectives

It is significant to grasp the contamination level of Polycyclic Aromatic Hydrocarbons (PAHs) in water environment, because PAHs are emitted by human activity and indicators of urbanization. Da Nang city is rapidly developing in recent years and it is expected that the advance of industrialization and the change of transportation trigger the contamination of PAHs there. Main objective of this study is to show the contamination level of 15 PAHs in water environments in Da Nang, Vietnam and to examine their adsorption characteristics on soil.

2. Materials and Methods

In Da Nang, surface sediment of lakes and rivers, surface water, road dust, domestic wastewater and industrial wastewater were collected in rain season in 2012 and dry season in 2013. Filtrates of water sample were pretreated by solid phase extraction (SPE). After drying sediment, road dust and suspended solids of water sample were extracted by ultrasonic and pretreated by SPE. In batch adsorption experiments, red soil, river sand and natural soil in Da Nang as an adsorbent and 3 PAHs or 15 PAHs mixture as an adsorbate were mixed in *Milli-Q* and shaken horizontally for 72 hours under 25 ± 1 °C. Samples were analyzed by HPLC/FL.

3. Results and Discussion

PAHs were detected in sediment, environmental water, road dust, domestic wastewater and industrial wastewater in Da Nang. PAHs contents in sediment are shown in **Fig. 1** with contamination level in the other cities. **Table 1** indicates the name and abbreviation of every PAH. Contents of Phe and Flu in sediment of Da Nang were higher than those in Hanoi and Ho Chi Minh. Mean Content of Flu in sediment in urban area in the rain season was 1,584 ng-g/dry and it was higher 19.8 times than it in Hanoi and 45.3 times than it in Ho Chi Minh. Contents of BaP, which is a typical PAH with carcinogenicity, were 32 ng/g-dry in urban area (rain season) and 47 ng/g-dry in urban area (dry season). Contents of BaP in sediment of Da Nang were similar to the contamination level in Lake Biwa. In the batch experiments, adsorption characteristics of PAHs on a natural soil in Da Nang are shown.

4. Conclusion

Contamination levels of 15 PAHs in Da Nang, Vietnam were shown in this study, and PAHs were especially concentrated in sediment of urban area.

Table 1 Name list of PAHs (Abbreviation)

Phenanthrene(Phe)	Benz[<i>a</i>]anthracene(BaA)
Fluoranthene(Flu)	Benz[<i>k</i>]fluoranthene(BkF)
Pyrene(Pyr)	Benz[<i>a</i>]pyrene(BaP)
Indeno[1,2,3- <i>c,d</i>]pyrene(IcdP)	

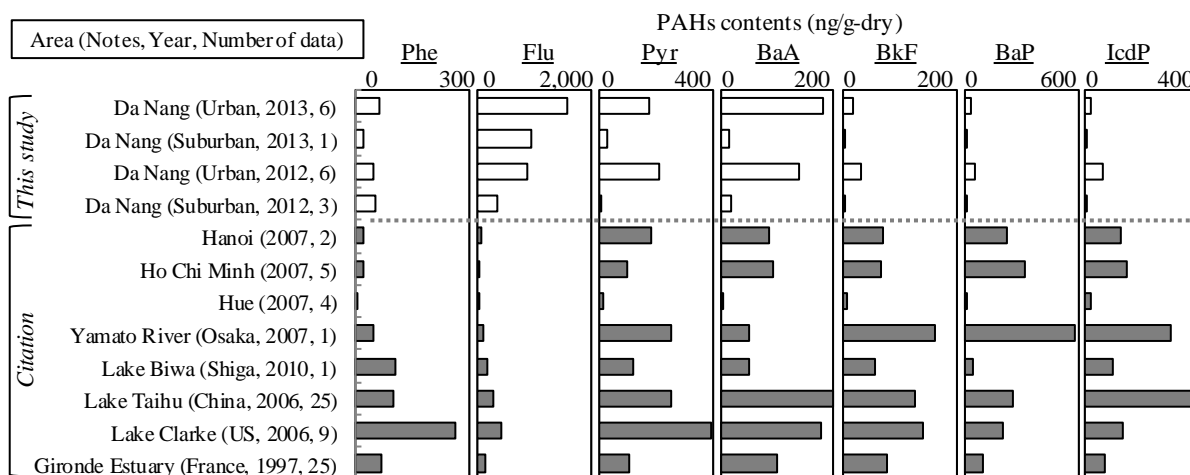


Fig. 1 Mean value of PAHs contents in Sediment of Da Nang (Comparison with other areas) (Citation) Kishida, *et al.*, 2007. Itoh, *et al.*, 2010. Qiao, *et al.*, 2006. Ko, *et al.*, 2007. Bundzinski, *et al.*, 1997.