Concentrations of atmospheric polycyclic aromatic hydrocarbons in particulate matter and the gaseous phase at roadside sites in Hanoi, Vietnam

Kishida M., Imamura K., Takenaka N., Maeda Y., Viet P.H., Bandow H.
Research Institute of Environment, Agriculture, and Fisheries, Osaka Prefectural Government, 1-3-62 Nakamichi, Higashinari-ku, Osaka 537-0025, Japan; Environmental Management Division, Department of Environment, Agriculture, and Fisheries, Osaka Prefectural Government, 2-1-2 Otemae, Chuo-ku, Osaka 537-0025, Japan; Graduate School of Engineering, Osaka Prefecture University, 1-1 Gakuen-cho, Naka-ku, Sakai, Osaka 599-8531, Japan; College of Science, Vietnam National University of Hanoi, T3 Building, 333 Nguyen Trai St., Thanh Xuan District, Hanoi, Viet Nam

Abstract: We analyzed the concentrations of polycyclic aromatic hydrocarbons (PAHs) in both particulate matter (PM) and the gaseous phase at 10 roadside sites in Hanoi, Vietnam. The average concentrations of 47 PAHs (Σ47PAHs) were 63 ± 82 ng m^{-3} in PM and 480 ± 300 ng m^{-3} in the gaseous phase. The PAHs mainly originated from motorcycles without catalytic converters. The highest concentrations of Σ47PAHs in both PM and the gaseous phase were observed at a terminal for buses and trucks. The operation of large commercial vehicles led to increased PAH pollution at the terminal site.

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Correspondence Address: Kishida, M.; Environmental Management Division, Department of Environment, Agriculture, and Fisheries, Osaka Prefectural Government, 2-1-2 Otemae, Chuo-ku, Osaka 537-0025, Japan; email: kishida82477@iris.eonet.ne.jp
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- Kishida, M., Research Institute of Environment, Agriculture, and Fisheries, Osaka Prefectural Government, 1-3-62 Nakamichi, Higashinari-ku, Osaka 537-0025, Japan, Environmental Management Division, Department of Environment, Agriculture, and Fisheries, Osaka Prefectural Government, 2-1-2 Otemae, Chuo-ku, Osaka 537-0025, Japan
- Imamura, K., Research Institute of Environment, Agriculture, and Fisheries, Osaka Prefectural Government, 1-3-62 Nakamichi, Higashinari-ku, Osaka 537-0025, Japan
- Takenaka, N., Graduate School of Engineering, Osaka Prefecture University, 1-1 Gakuen-cho, Naka-ku, Sakai, Osaka 599-8531, Japan
- Maeda, Y., Graduate School of Engineering, Osaka Prefecture University, 1-1 Gakuen-cho, Naka-ku, Sakai, Osaka 599-8531, Japan
- Viet, P.H., College of Science, Vietnam National University of Hanoi, T3 Building, 333 Nguyen Trai St., Thanh Xuan District, Hanoi, Viet Nam
- Bandow, H., Graduate School of Engineering, Osaka Prefecture University, 1-1 Gakuen-cho, Naka-ku, Sakai, Osaka 599-8531, Japan

References:

- (2004) Key Indicators of Developing Asian and Pacific Countries, , Asian Development Bank
- Commins, B.T., Interim report on the study of techniques for the determination of polycyclic aromatic hydrocarbons in air (1962) Natl Cancer Inst Monogr, 9, pp. 225-233
- Cotham, W.E., Bidleman, T.F., Polycyclic aromatic hydrocarbons and polychlorinated biphenyls in air at an urban and a rural site near Lake Michigan (1995) Environ Sci Technol, 29, pp. 2782-2789. , doi: 10.1021/es00011a013
- Hien, T.T., Nam, P.P., Sadanaga, Y., Kameda, T., Takenaka, N., Bandow, H., Comparison of particle-phase polycyclic aromatic hydrocarbons and their variability causes in the ambient air in Ho Chi Minh City, Vietnam and Osaka, Japan, during 2005-2006 (2007) Sci Total Environ, 382, pp. 70-80. , doi: 10.1016/j.scitotenv.2007.04.013
- Hien, T.T., Thanh, L.T., Kameda, T., Takenaka, N., Bandow, H., Distributions of characteristics of polycyclic aromatic hydrocarbons with particle size in urban aerosols at the Roadside in Ho Chi Minh City, Vietnam (2007) Atmos Environ, 41, pp. 1575-1586. , doi: 10.1016/j.atmosenv.2006.10.045
- Khalili, N.R., Scheff, P.A., Holsen, T.M., PAH source fingerprints for coke oven, diesel and gasoline engines, highway tunnels, and wood combustion emissions (1995) Atmos Environ, 29, pp. 533-542. , doi: 10.1016/1352-2310(94)00275-P
- Lan, T.T.N., Nishimura, R., Tsujino, Y., Imamura, K., Warashina, M., Hoang, N.T., Maeda, Y., Atmospheric concentrations of sulfur dioxide, nitrogen oxides, ammonia, hydrogen chloride, nitric acid, formic and acetic acid in the south of Vietnam measured by the passive sampling method (2004) Anal Sci, 20, pp. 213-217. , doi: 10.2116/analsci.20.213
- Lao, R.C., Thomas, R.S., Oja, H., Dubois, L., Application of a gas chromatograph-mass spectrometer-data processor combination to the analysis of the polycyclic aromatic hydrocarbon content of airborne pollutant (1973) Anal Chem, 45, pp. 908-915. , doi: 10.1021/ac60328a006

- Lu, G.N., Dang, Z., Tao, X.Q., Yang, C., Yin, X.Y., Modeling and prediction of photolysis half-lives of polycyclic aromatic hydrocarbons in aerosols by quantum chemical descriptors (2007) Atmos Environ, 373, pp. 289-296
- Mandalakis, M., Tsapakis, M., Tsoga, M., Stephanou, E.G., Gas-particle concentrations and distribution of aliphatic hydrocarbons, PAHs, PCBs, and PCDD/Fs in the atmosphere of Athens (Greece) (2002) Atmos Environ, 36, pp. 4023-4035. , doi: 10.1016/S1352-2310(02)00362-X
- Park, J.S., Wade, T.L., Sweet, S., Atmospheric distribution of polycyclic aromatic hydrocarbons and deposition to Galveston Bay, Texas, USA (2001) Atmos Environ, 35, pp. 3241-3249. , doi: 10.1016/S1352-2310(01)00080-2
- Rogge, W.F., Hildemann, L.M., Mazurek, M.A., Cass, G.R., Simoneit, B.R.T., Sources of fine organic aerosol 2: Noncatalyst and catalyst-equipped automobiles and heavy-duty diesel trucks (1993) Environ Sci Technol, 27, pp. 636-651. , doi: 10.1021/es00041a007
- Waller, R.E., The benzpyrene content of town air (1952) Br J Cancer, 6, pp. 8-21
- Yamasaki, H., Kuwata, K., Miyamoto, H., Effect of ambient temperature on aspects of airborne polycyclic aromatic hydrocarbons (1982) Environ Sci Technol, 16, pp. 189-194. , doi: 10.1021/es00098a003
- Yunker, M.B., Macdonald, R.W., Vingarzan, R., Mitchell, R.H., Goyette, D., Sylvestre, S., PAHs in the Fraser river basin: A critical appraisal of PAH ratios as indicators of PAH sources and composition (2002) Org Geochem, 33, pp. 489-515. , doi: 10.1016/S0146-6380(02)00002-5
- Zakaria, M.P., Takada, H., Tsutsumi, S., Ohno, K., Yamada, J., Kouno, E., Kumata, H., Distribution of polycyclic aromatic hydrocarbons (PAHs) in rivers and estuaries in Malaysis-A widespread input of petragenic PAHs (2002) Environ Sci Technol, 36, pp. 1907-1918