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Comparison of polycyclic aromatic hydrocarbons and nitropolycyclic aromatic hydrocarbons in particulates between motorcycle and automobile exhausts

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　　Polycyclic aromatic hydrocarbons (PAHs) and nitropolycyclic aromatic hydrocarbons (NPAHs) are widespread environmental pollutants. Most carcinogenic PAHs and NPAHs have been found to associate with fine particulates. Motor vehicles or road vehicles have been known as one of man-made sources which generate a wide variety of PM, predominantly in fine particulates. Motorcycle is popular vehicle and major contributor to atmospheric pollution in South-East Asian countries. In this study, we investigated PAHs and NPAHs in particulates exhausted from motorcycles and compared them to the values in automobile exhausts to better understand the differences between motorcycle and automobile exhausts and the contribution of PAHs and NPAHs from motorcycle exhausts to the atmosphere.

　　The emissions of particulate phase PAHs and NPAHs were investigated from different 10 in-use motorcycles. The sampling of the exhausts from motorcycles was carried out on a chassis dynamometer according to European driving cycle ECE-R40. Eleven PAHs and four NPAHs were determined by high-performance liquid chromatography with fluorescence and chemiluminescence detections, respectively.

　　The result showed that Flu and Pyr accounted for more than 50% of the total PAHs. 6-Nitrochrysene and 7-nitrobenz[a]anthracene were the predominant NPAHs in motorcycle exhausts. Despite small engine size, motorcycles emitted much more PM and also PAHs than those from automobiles. However, the NPAHs emissions were not so different between two kinds of particulates. PM emitted from motorcycles showed stronger PAHs-related carcinogenicity and indirect-acting mutagenicity and but weaker NPAHs-related direct-acting mutagenicity than PM from automobiles. This study will provide useful information to design emission regulations and standards for motorcycles.