



Polyaromatic hydrocarbons from modern cars and trucks in real-driving at cold ambient temperatures: contributions in particulate matter and semi-volatile compounds

Päivi Aakko-Saksa¹, Anssi Järvinen¹, Hannu Kuutti¹, Wojciech Honkisz², Katariina Kylämäki³, Milja Jäppi³, Petteri Marjanen³, Matti Rissanen³, Tereza Cervena⁴, Michal Vojtisek⁴, Luis Barreira⁵, Sanna Saarikoski⁵, Bo Strandberg⁶, Taina Ohra-aho¹, Jan Topinka⁴, Piotr Bielaczyc², Topi Rönkkö³, and Hilikka Timonen⁵

¹VTT Technical Research Centre of Finland, Espoo (VTT), Finland (paivi.aakko-saksa@vtt.fi)

²BOSMAL Automotive Research and Development Institute Ltd

³Tampere University, Aerosol Physics Laboratory,

⁴The Institute of Experimental Medicine of the CAS

⁵Finnish Meteorological Institute

⁶Lund University

Vehicular particulate matter (PM) emissions have been studied widely in view of their composition and health effects, while less is known of the composition of the semi-volatile compounds (SVC) fraction. Furthermore, tightening exhaust emission standards in road-transport sector do not cover semi-volatiles or harmful polyaromatic hydrocarbons (PAHs) and their derivatives dibenzothiophenes (DBTs), nitrated (nitro-PAHs) and oxygenated (oxy-PAHs) PAHs present in vehicular exhaust. We studied PAH and their derivatives emissions from PM and SVC fractions collected from the exhaust from modern cars and trucks during real-driving at cold ambient temperatures.

PAHs were found in higher concentrations from the SVC fraction than from the PM. Carcinogenic heavy PAHs were present mainly in the PM, while lighter PAHs dominated the SVC fraction. Oxy-PAHs were found in samples and in some cases, nitro-PAHs and DBTs were also detected. PAH emissions originate mainly from incomplete combustion of fuel and lubricating oil.

Even for the most modern cars and trucks, PAH species were found in the exhaust. Many PAH groups detected are not included in the air quality monitoring. The potential of PAH found in the exhaust of modern cars and trucks to pose harmful health effects emphasizes the need for further development of fuels, lubricating oils, engines and aftertreatment technologies to mitigate these emissions

This work was supported by the European Union's horizon Europe research and innovation programme under grant agreement No 101096133 (PAREMPI: particle emission prevention and impact: from real-world emissions of traffic to secondary PM of urban air).

