The effect of fuel applied on the chemical composition of PM generated in combustion processes – the preliminary case study

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Introduction

It has been known for a long time, that alongside natural sources, combustion processes are the one of many human activities which emit solid particles. However, there is still no documented evidence for any relationship between specific stationary combustion technologies and the presence of particulate matter in the atmosphere. Similarly, the chemical composition of particles emitted from various sources has to be identified in order to properly apportion the ambient air pollution by particulate matter.

Methods and materials

The study presents the chemical characterisation of particles emitted during residential and industrial processes of combustion of solid fuels (representing the stationary emission sources) and particles emitted from Diesel engines for passenger cars and medium-duty vehicles. Particles from stationary sources were collected on quartz fibre filters. Particle samples from engines were collected on glass-fibre filters during the New European Driving Cycle and European Steady Cycle emission tests conducted in BOSMAL Automotive Research & Development Institute.

Results

8.0, 9.7, 13, and 56.9 and 58.5 mg of particulate matter were sampled during combustion of, respectively, soft wood, culm, eco-pea coal, hard coal in domestic heating units which contribute to 20.9, 36.7, 5.3 and 464.7 mg of PM per m³ of flowing through the filter exhausts. During sampling of particles from industrial combustion of hard coal burning 58.5 mg PM were sampled which contribute to 5.9 mg of particles per m³ of exhausts.

Conclusions

The content of analysed chemicals differed depending on the emission source. With respect to stationary combustion sources, the main factor determining the emission of solid particles are related principally to the fuel quality. The duty of vehicles was also a factor influencing the chemical characterisation of particulate matter emitted from engines. The current efforts to control fine particulates also result in the appreciable reduction of the total number of particles emitted by both diesel and gasoline engines.

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