

Occurrence of PAHs and new tracer of polyethylene plastic combustion, 1,3,5-triphenylbenzene in PM10 collected in residential area of Krakow agglomeration, South Poland

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Over the last few decades a concern over the health effects associated with air pollution was growing, mainly due to their carcinogenic and mutagenic properties. Nowadays, many harmful aerosols enter the atmospheric air. Atmospheric aerosols constitute a complex mixture of organic and inorganic compounds and biological materials. The group of the most widespread and particularly dangerous atmospheric pollutants in the present times includes particulate matter (e.g. PM1, PM2.5, PM10). They have sorption properties, and thus, other harmful compounds may be deposited on their surface. The most dangerous of these compounds are polycyclic aromatic hydrocarbons (PAHs).

The aim of the study was determination of chemical composition of atmospheric aerosols collected in Krakow agglomeration (Wadowice) from February 2017 to October 2017. One aspect of research was to fill the gap on the occurrence of tracers of co-combustion of polyethylene plastics in residential boiler. All samples were taken using a low-volume sampler PNS-15 on quartz fibre filters and represent PM10 fraction collected with 24h resolution. The analytical work comprised determinations of PAHs (e.g. anthracene, benzo(a)pyrene, chrysene, naphthalene, pyrene) and 1,3,5-triphenylbenzene (135TPB) by means of gas chromatography-mass spectrometry (GCMS)(Trace 1310 Gas Chromatograph, ITQ 900 Mass Spectrometer, TriPlus RHS Autosampler). The elemental carbon (EC) and organic carbon (OC) were measured with a Sunset Laboratory OCEC Aerosol Analyzer using EUSAAR2 protocol.

Concentration of particulate matter in 2017 ranged from 10,80µg/m³ in August to 406,80µg/m³ in January. The highest concentration of PM10 was recorded in the colder months of 2017. The concentrations of PM10 in colder months was much above the daily limit value (50µg/m³). In the warmer months, concentration of PM10 did not exceed the acceptable standards. The average concentration of OC recorded in colder months of 2017 was 121,98µg/m³, while in warmer months was 5,88µg/m³. The same relationship was noted for the analysis of concentrations of polycyclic aromatic hydrocarbons. Concentrations of PAHs in March was 8 times higher than in August. The analyses showed an 7 times higher concentration of carcinogenic PAHs in March (70,10ng/m³) than in August (9,42ng/m³). Analyses confirmed the presence of 1,3,5-triphenylbenzene, in whole measuring period, and its average concentration was 0,99ng/m³ and 0,29ng/m³, in March and August, respectively. 135TPB is one of many exhaust gas components caused by burning of polyethylene plastics (mainly plastic bags). It is important to urgently expand the environmental monitoring strategy with new tracers, especially 135TPB. This will allow to get more accurate information on the threat to human health from the presence of air pollutants.

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