Summary

One of the most significant factors having a great impact on human living standards is air pollution. Man's standard of living, is linked to his health, and this is fundamentally influenced by the state of the environment where we live. Therefore, constant control of the level of air pollution with modern measurement methodologies is necessary to minimize its impact on human health. The main factor which contributes the level of air pollution, is particulate matter (citation) [1-4].

In this dissertation, I present a series of papers related to the identification of sources of particulate matter (PM_{10} and $PM_{2.5}$) on the basis of elemental analysis of particle samples studied. The Horiba PX-375 analyser, which enables the measurement of the elemental composition of particle with high temporal resolution (0.5-1h), was used to perform the present study. At the same time, I would like to thank Horiba GmbH, based in Austria, for making the Horiba PX-375 analyser available to me for research purposes related to Ph.D. The studies were conducted during several measurement campaigns in the years 2019 - 2021. In 2019-2020, a measurement cycle consisting of three sessions was performed in winter 2019, summer 2020 and winter 2020. The study was performed in the village of Kotórz Mały (Opolskie Voivodeship) in a measurement station specially built for this purpose. The results obtained from three sessions allowed a very large set of representative measurement data to be collected. As part of these campaigns, the elemental composition of PM_{10} was measured in one-hour sampling campaign. The next measurement session took place in February 2020, it was a two-day study in the laboratory of the School of Fire Service. The aim of this studywas to determine and mathematically interpret the mass distribution and number of dust grains relative to aerodynamic diameter during the combustion of different types of materials in fires. A further seven-day study was conducted in August 2021. The main objective of the study was to assess the diurnal and hourly variability of concentrations of five selected elements (Pb, Ni, Zn, Mn and V) associated with $PM_{2.5}$ fine particulate matter in a typical urban center near Warsaw.

In addition, a comparative study between the measurement methodology used and the reference methodology (gravimetric method + atomic absorption spectrometry GM+AAS) was carried out in 2021, as well as a number of studies were carried out at selected receptors in Warsaw located along major traffic routes and fire stations equipped with heavy firefighting equipment.

In addition, the obtained results were compared with bioindication methods (using bioindicators to assess air quality), which was a supplement to classical studies.

My studies were conducted in cooperation with numerous scientific centers in Poland, including: The Higher School of Fire Service in Warsaw, the Opole University of Technology, the Warsaw University of Life Sciences, University of Wroclaw and the Institute of Fundamentals of Environmental Engineering of the Polish Academy of Sciences in Zabrze.

The studies have demonstrated the excellent the excellent usability of the applied methodology for the purpose of identifying the origin of particle matter, and as a consequence, the possibility of proposing and using the above-mentioned methods.

methodology as one of the key elements leading to the reduction of the concentration of PM - bound pollutants in air.