

Non-regulated emissions from the gasoline vehicles - an ion chromatography analysis of the anions

W. Pacura¹, K. Szramowiat-Sala¹, J. Golas¹, P. Bielaczyc²

¹AGH University of Science and Technology, Al. Mickiewicza 30, 30-059 Krakow, Poland, ²BOSMAL Automotive Research and Development Institute Ltd., Ul. Sarni Stok 93, 43-300 Bielsko-Biala, Poland

Introduction

In 2019 over 600 thousands of new passengers and light duty vehicles were registered in Poland, one should add this to the total number of 25 millions registered cars. While the European Emissions Standards limits most harmful compounds such as hydrocarbons or various oxides, there is a number of non-regulated pollutants that are so far omitted by legislation. Taking into account that half of the vehicles travel over 10.000 km per year even seemingly insignificant levels of emission add up to a great number.

Methodology

The passenger and light duty vehicles under 3500 kg were tested according to the Worldwide Harmonised Light Vehicle Test Procedure (WLTP) requirements on the chassis dynamometer. Part of the emitted solid particles was collected on the 47 mm filters and weighted to establish particulate matter mass (PM) and number of the particles (PN). The anions adsorbed on the solid particles surface were extracted and analysed using Thermo Scientific ICS-1100 Ion Chromatograph equipped with IonPac AS22 Column.

Results & Conclusions

The analysed particulate matter origins from the four Euro 6b compliant vehicles powered by the gasoline engine. The PM was analysed with ion chromatography to measure the ion concentration, such as fluorides F^- , chlorides Cl^- , bromides Br^- , nitrites NO_2^- , nitrates NO_3^- , sulphates SO_3^{2-} and phosphates PO_4^{3-} . Sulphates were of the highest concentration, what can be explained by the legally allowed level of the sulphur in the gasoline, while the bromides were below the detection limit. In total, all anions accounted for about 6% of the PM mass. Anions might be part of salts, therefore cation analysis is the subject of current studies. The additives improving the properties of gasoline or engine oil may be the source of the positive ions.

Study of the non-regulated compounds is crucial in the establishing of the influence of solid particles on health and environment. Furthermore extended studies can provide a basis for the further research of vehicle emission or other fields such as medicine or material engineering.

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