Spectrochemical analysis of Particulate Matter collected from on-road Diesel engine passenger vehicles by LIBS

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In this research we apply Laser Induced Breakdown Spectroscopy analytical measurement technique for qualitative and quantitative spectrochemical analysis of Particulate Matter (PM) formed from in-use Diesel engine passenger vehicles.

We analysed particulate matter from sixty-seven different Diesel engine passenger vehicles of major EU car producers used in daily life environment. The aim of this study is to compare PM composition, mainly agglomerated major and minor chemical elements. Especial attention is given to analyse different PM and perform a quantification and calibration of LIBS spectral signal. The presence of agglomerated chemical elements in exhaust emissions from on-road passenger vehicles are due to different processes involved within the diesel combustion. All these initial parameters influence the final chemical composition of exhaust emissions as well as the Diesel particulate matter emitted from in-use Diesel engine vehicles.

Currently there are none specific emission standards for additional compounds or chemical elements contained in the exhaust emissions i.e. exhaust vapour, Diesel particulate matter, particulate matter, black carbon, or in the soot, formed by the Diesel or biodiesel, from combustion driven engines. Even though agglomerated chemical elements additional to carbon, presents a very large fraction of the total DPM or soot emission contents. Particularly the inhalation of metal dusts and ions has numerous negative health effects, especially upon long-term exposure. Automotive emissions are considered as the dominant source for airborne metal pollution in urban areas. Therefore accurate in-situ technique to assess the on-line elemental composition of particulate matter from automotive emissions would be desirable.