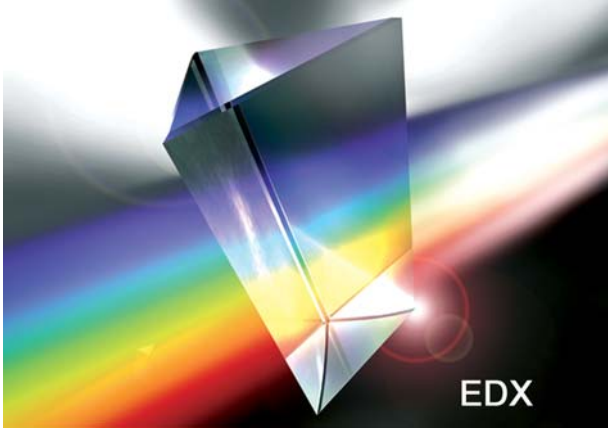
Application Note



EDXRF Analysis of Vehicle Exhaust Particulates

As environmental awareness grows steadily, research into exhaust emissions from sources such as factories and vehicles which cause air and environmental pollution has gained in importance. Particles separated and collected from exhaust gases, or collected on filter paper, can be simply and conveniently analyzed with EDX. Shown below is an example of a qualitative and quantitative analysis of vehicle exhaust particulates.

Sample

The standard environmental sample NIES (National Institute for Environmental Studies) No.8 "**Vehicle Exhaust Particulates**" was analyzed.

Sample Preparation

Using a vinyl chloride ring, the sample was pressed into shape under a total pressure of 10 t applied for 10 seconds.

Result of qualitative Analysis

The result of the qualitative analysis of the vehicle exhaust particulates is shown in Fig. 1. By using an Al filter the presence of Cl has been detected (Bottom left graph).

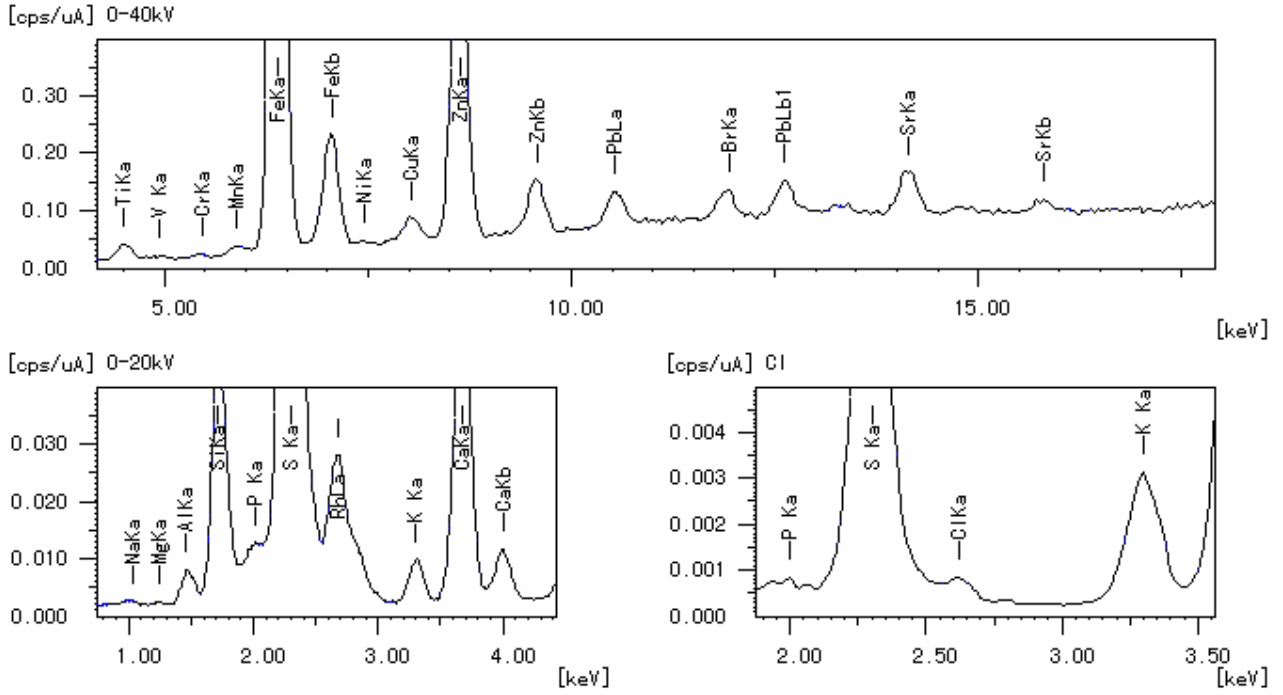


Fig.1 Qualitative Analysis of Vehicle Exhaust Particulates

Result of Quantitative Analysis

The result of the quantitative analysis derived by the FP method from the qualitative analysis result on the previous page is indicated in Table 1 together with the standard values. Note that in the quantitative calculations the major was assumed to be carbon(C) and used as the balance (residue).

Table 1 Quantitative Value of Vehicle Exhaust Particulates by FP Method

Element	Quantitative Value (%)	Standard Value (%)	Deviation(%)
$_{11}$Na	0.171	0.192	-0.021
$_{12}$Mg	0.022	0.101	-0.079
$_{13}$Al	0.163	0.330	-0.167
$_{14}$Si	0.793		
$_{15}$P	0.052	0.051	0.001
$_{16}$S	1.837		
$_{17}$Cl	0.042	0.085	-0.043
$_{19}$K	0.080	0.115	-0.035
$_{20}$Ca	0.456	0.530	-0.074
$_{22}$Ti	0.028	0.027	0.001
$_{23}$V	0.006	0.002	0.004
$_{24}$Cr	0.004	0.003	0.001
$_{25}$Mn	0.006	0.008	-0.002
$_{26}$Fe	0.302	0.490	-0.188
$_{28}$Ni	0.003	0.002	0.001
$_{29}$Cu	0.006	0.007	-0.001
$_{30}$Zn	0.069	0.104	-0.035
$_{35}$Br	0.004	0.006	-0.002
$_{38}$Sr	0.005	0.009	-0.004
$_{82}$Pb	0.015	0.022	-0.007

Analytical Conditions

Instrument: EDX-700
X-ray Tube: Rh target
Filter: not used
Voltage - Current: 50 kV-17 μA (Auto)
15 kV-175 μA (Auto)
Atmosphere: Vacuum
Measurement Diameter: 10 mm
Measuring Time: 600 sec
Dead Time : 25-26 %

Reference

Standard Environmental Sample NIES No.8 “Vehicle Exhaust Particulates” – The Preparation, Analysis, and Guaranteed Quality of the Vehicle Exhaust Particulate Standard Sample – National institute for Environmental Studies Measurement Technology, Mr. Kensaku Okamoto. Article extracted from the Environmental Studies Quarterly 1987 No.66. Published September 1987. Environmental Research Center (incorporated foundation) Issue.