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EDXRF1893 - Analysis of Lead in Gasoline by ASTM D5059 Bi IS Method



Scope

This application note details the performance for the measurement of lead (Pb) in gasoline as per ASTM D5059 using the Bi internal standard method Part C (ultra-low lead for MoGas, motor gasoline) and Part A (high Pb for AvGas, aviation gasoline).

Background

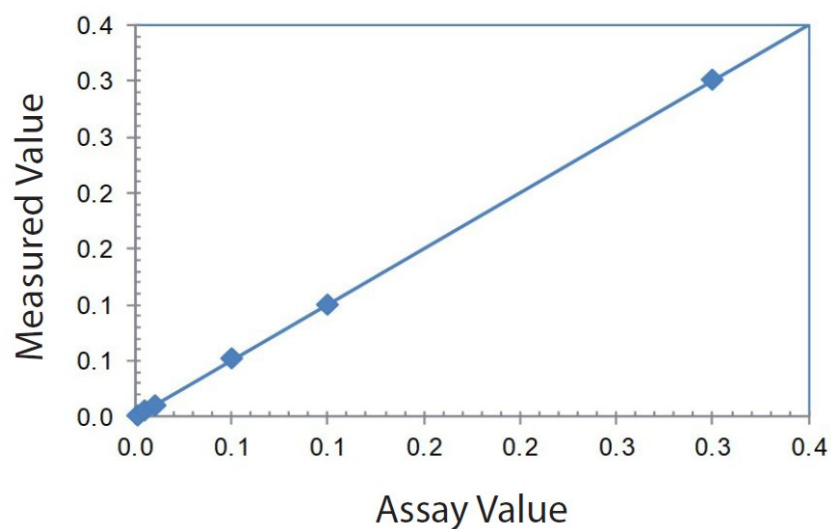
Tetraethyl lead (TEL) is an anti-knock agent added to gasoline, or petrol. Lead is a toxic metal that interferes with anti-pollution devices and contributes to lead poisoning. In the 1970s, regions around the world began phasing out lead in motor gasoline, beginning in the United States and Europe. Lead is still used in AvGas for some piston engine propeller aircraft; however, efforts are being made to lower and remove lead in this fuel as well. One of the main international standard test methods for the measurement of lead in gasoline is ASTM D5059 using X-ray spectroscopy, XRF (X-ray fluorescence). As efforts continue to reduce and remove lead from gasoline fuels worldwide, Applied Rigaku Technologies offers EDXRF analyzer [NEX QC+](#) using direct excitation for the measurement of lead by ASTM D5059 as well as many other applications in the petroleum and fuel industries.

ASTM D5059 calibration

Empirical calibration was made using commercially available standards.

Part C (MoGas)

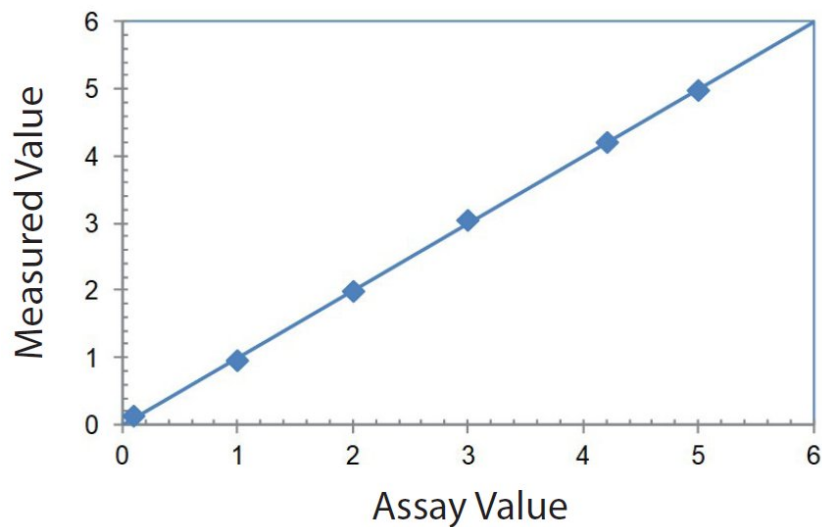
Element: Pb		
Units: g/US gal		
Sample I.D.	Standard value	Calculated value
1	0.001	0.0009
2	0.005	0.0047
3	0.010	0.0099
4	0.050	0.0511
5	0.100	0.0993
6	0.300	0.3001



Correlation plot Pb

Part A (AvGas)

Element: Pb		
Units: g/US gal		
Sample I.D.	Standard value	Calculated value
1	0.1	0.125
2	1.0	0.954
3	2.0	1.996
4	3.0	3.040
5	4.2	4.196
6	5.0	4.986



Correlation plot Pb

Precision

Unknown MoGas and AvGas samples were used to demonstrate precision. To minimize evaporation error, each sample was measured 5x repeat measurements in a static position.

Unknowns Units: g/US gal			
Sample I.D.	NEX QC+ average value	Standard value	RSD (%)
MoGas	0.0586	0.0012	2.0
AvGas	1.292	0.006	0.6

ASTM D5059

Standard test methods for lead in gasoline by X-ray spectroscopy

The test methods cover the determination of the total lead content of a gasoline within the following concentration ranges:

Part C	Part A
0.010 to 0.5 g Pb/US gal	0.10 to 5.0 g Pb/US gal
0.012 to 0.6 g Pb/UK gal	0.12 to 6.0 g Pb/UK gal
0.0026 to 0.132 g Pb/L	0.026 to 1.32 g Pb/L

Conclusion

The results shown here indicate that NEX QC+ easily meets ASTM D5059 Parts A and C using the Bi internal standard method for measuring lead anti-knock agent in MoGas and AvGas samples, as well as other similar fuels such as jet fuel

Related products



NEX QC Series

Combines quality, affordability, and performance for a wide range of applications