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EDXRF3001 - Pb in Gasoline by ASTM D5059 Part C and A



Scope

Cartesian Geometry EDXRF performance is demonstrated for the measurement of lead (Pb) in gasoline as per ASTM D5059 using the Bi internal standard method Part C (ultra-low Pb) and Part A (high Pb).

Background

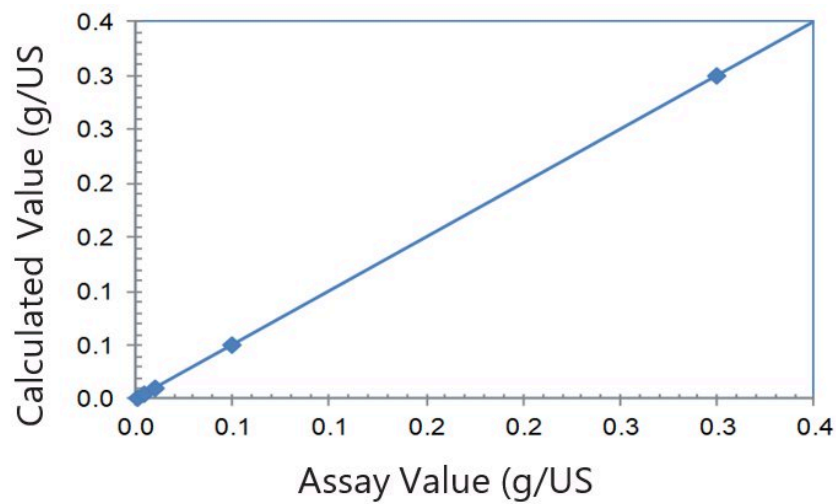
Tetraethyl lead (TEL) is an anti-knock agent added to gasoline, or petrol. Lead is a toxic metal that interferes with anti-pollution devices and contributes to lead poisoning. In the 1970s, regions around the world began phasing out lead in MoGas (motor gasoline), beginning in the United States and Europe. Lead is still used in AvGas (aviation gasoline) 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 CG II](#) using indirect excitation Cartesian Geometry for the measurement of lead by ASTM D5059 as well as many other applications in the petroleum and fuel industries.

Calibration

Empirical calibration was made using commercially available standards. The user spikes each standard and the blank with the Bi IS as described for Part C or A. Calibration is then g/US gal Pb vs. I, where I is the X-ray intensity expressed as (Pb net cps / Bi gross cps).

Part C

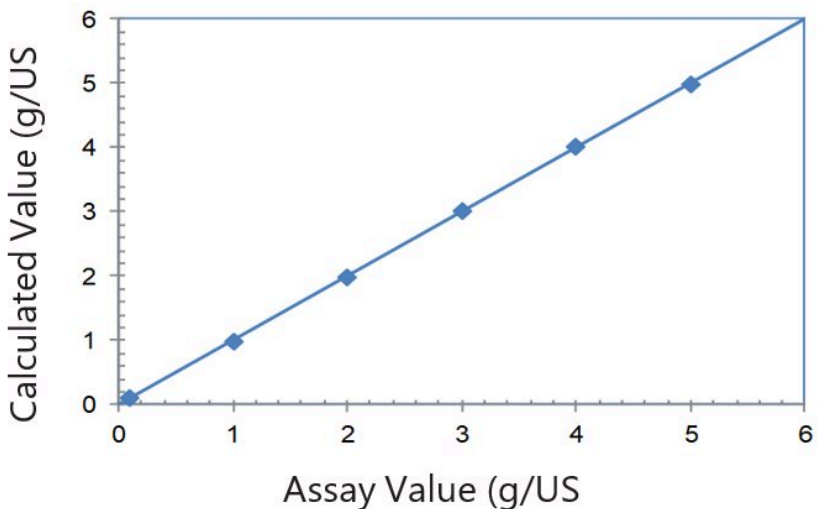
Element: Pb		
Units: g/US gal		
Sample I.D.	Standard value	Calculated value
1	0.001	0.0007
2	0.005	0.0051
3	0.010	0.0103
4	0.050	0.0505
5	0.100	0.9960
6	0.300	0.3000



Correlation plot Pb Part C

Part A

Element: Pb		
Units: g/US gal		
Sample I.D.	Standard value	Calculated value
1	0.1	0.108
2	1.0	0.990
3	2.0	1.986
4	3.0	3.020
5	4.0	4.005
6	5.0	4.991



Correlation plot Pb Part A

Precision

Instrument repeatability (precision) is determined by five repeat analyses of each sample in static position. To minimize evaporation error, five repeat measurements of each sample were taken for demonstration.

Element: Pb				
Units: g/US gal				
Sample	Assay value	Average measured value	Std. dev	% Relative deviation
Part C 2	0.0050	0.0054	0.0006	12%
Part C 6	0.3000	0.3008	0.0015	0.5%
Part A 1	0.1000	0.1010	0.0015	1.5%
Part A 2	1.000	0.9921	0.0013	0.1%
Part A 6	5.000	4.932	0.0067	0.1%

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 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
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Conversion factors: 3.7854 g/US gal = 4.5461 g/UK gal = 1.0000 g/L

Conclusion

The results shown here indicate NEX CG II easily meets ASTM D5059 Parts A and C using the Bi internal standard method for the measurement of lead in gasoline.

Related products



NEX CG II Series

High-performance *indirect excitation* EDXRF for complex applications with trace elements and variable base matrices