Application Note EDXRF2099

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EDXRF2099 - Manganese in Gasoline by ASTM D5059 Part D

Scope

The analysis of manganese (Mn) in MoGas (motor gasoline) and AvGas (aviation gasoline) is demonstrated as per ASTM D5059 Part D XRF using Cartesian Geometry EDXRF.

Background

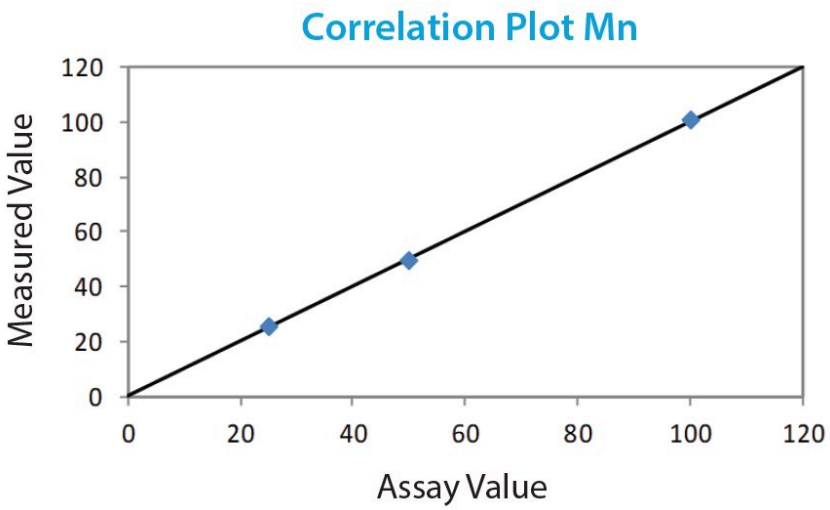
Methylcyclopentadienyl manganese tricarbonyl (called MMT or MCMT) is an anti- knock agent added to MoGas and AvGas to boost octane rating, replacing tetraethyl lead (TEL) in many regions of the world. In motor gasoline, the Mn content is typically between 50 - 500 mg/kg and can be as high as 3000 mg/kg (approximately 3 g/L) in AvGas. Reliably characterizing the Mn content of gasoline ensures optimum engine performance based on the engine's compression ratio and other geometrical and mechanical operating conditions. To meet the needs of the industry, Rigaku offers simple and versatile benchtop EDXRF analyzers for the analysis of manganese in gasoline. For optimum results in the ultra-low range, NEX CG II achieves exceptional detection limits using Cartesian Geometry EDXRF.

Calibration

Empirical calibration is made using commercially available certified gasoline calibration standards containing the Mn additive. A calibration is shown here as a demonstration of the optimal performance using Cartesian Geometry for the low range 25 - 100 mg/ kg Mn. The range can be extended up or down by adding appropriate standards to the calibration to cover desired Mn concentration range. Measurement time can be reduced if ultralow precision and detection limits are not required.

Units: mg/kg	

Standard I.D.	Assay Value	Measured Value
1	25	25.1
2	50	49.1
3	100	100



Precision

Instrument repeatability (precision) is determined by ten repeat analyses of each sample in static position

Element: Mn	Units: mg/kg			
Sample	Assay Value	Average Measured Value	Std. Dev	% Relative Deviation
1	25	25.2	0.1	0.4%
3	100	101	0.4	0.4%

Conclusion

The results shown here indicate the Rigaku NEX CG II Cartesian Geometry EDXRF analyzer can be used to reliably measure Mn in MoGas (motor gasoline) and AvGas (aviation gasoline) at low and ultra-low levels as per ASTM D5059 Part D. Higher levels of Mn can easily be measured by extending the calibration and using shorter measurement time.

Related products

NEX CG II Series

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