BRUKER

Chemical Analysis

Oxygenates Analyzer

- For the Analysis of Oxygenates in Gasoline According to ASTM D4815

think forward

Gas Chromatography

Bruker 4815 GC Oxygenates Analyzer

The Bruker 4815 GC Analyzer provides a highly cost effective solution for the analysis of oxygenates in gasoline, according to the widely used industry standard method ASTM D4815. The combination of Bruker's extremely reliable GC hardware, powerful software and industry leading pre- and post sales support teams make this analyzer package the most comprehensive solution available today.

- Optimized for analysis of oxygenated compounds in gasoline by ASTM D4815. The system is configured and fully tested at the factory to ensure data provided complies with the requirements of the standard method. Bruker will also install the system and check its performance in the laboratory.
- An easy to use, sophisticated solution. Bruker's 450-GC and Galaxie™ Chromatography Data Handling software are a powerful combination and key to generating reliable results. The Bruker 4815 GC Oxgenates Analyzer yields excellent results, regardless of the operator's skill level.
- An efficient, cost-effective and time-saving solution. All Bruker GC analyzers not only include proven GC hardware and software but are also pre-loaded with analysis methods and documentation specific to the method required. Operational procedures are fully documented.
- Complete, comprehensive single vendor solution. Bruker provides complete solutions without relying on third parties. The hardware, software, columns, application optimization, documentation, installation and support services are all supplied by Bruker. This solution allows analysis to be carried out quickly and efficiently, delivers effective troubleshooting and gives peace of mind from one complete, dependable, professional supplier.

Key Benefits

Overview

Oxygenated compounds can be present in various hydrocarbon matrices either because they were purposely added (e.g. into gasoline) or because they are naturally present or formed during catalytic processes such as polymer production. In gasoline, oxgenated compounds are added as 'anti-knock' agents to increase the octane number and decrease emissions by replacing organo-lead compounds.

The type and concentration of oxygenated compounds must be measured in reformulated gasolines as part of ongoing product quality assessment, and to confirm the oxygenated components have been added in the correct amounts according to regulatory requirements (e.g. California Air Resources Board). ASTM D4815 is frequently chosen as the standard method for the determination of oxygenated compounds. Individual ethers and alcohols are quantified in gasoline including: MTBE, ETBE, TAME, DIPE, C1-C4 alcohols and tert-amyl alcohol. Individual ether components are measured from 0.1 to 20.0 mass %. The individual alcohols are measured from 0.1 to 12.0 mass %.The analysis works as follows:

- The sample is introduced to the system via the split/splitless capillary inlet, vaporized and transferred to the first column (TCEP; micro-packed), where the lower boiling/non-polar components are separated from higher boiling/polar components. The lower boiling components (those eluting prior to methylcyclopentane) are then flushed to the vent.
- At a pre-determined time, the valve is switched and the higher boiling/ polar components retained on the first column are back-flushed onto the second non-polar capillary column which is placed in the analysis path. The components of interest are then eluted by the second column and separated based on individual boiling point and detected via the Flame Ionization Detector (FID). Once benzene and TAME have fully eluted, the second column is back-flushed and the remaining components are vented. Electronic flow control is used to increase the column pressure to accelerate elution of the remaining components as a composite peak, helping to reduce theoverall sample analysis time. A typical chromatogram is shown in Figure 1.

Note: Operational parameters, including gas flows, are controlled electronically to greatly simplify the analysis.

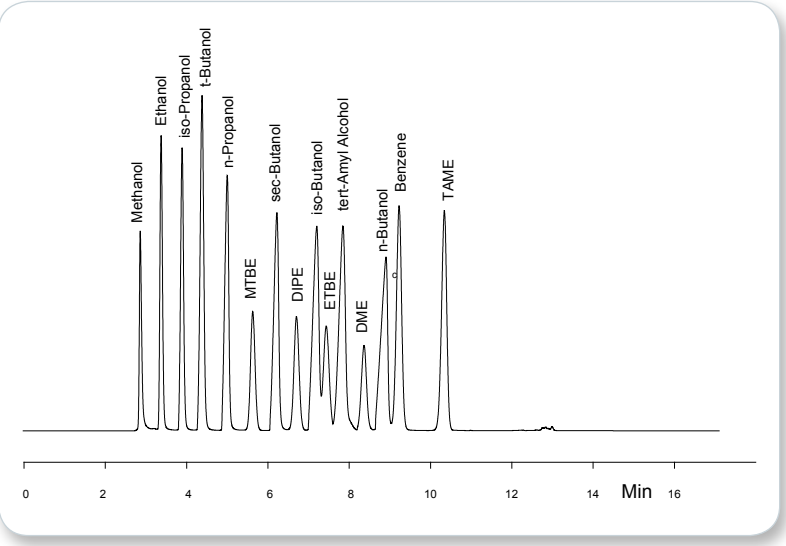

Figure 1: 4815 - Typical Chromatogram of the test sample.

Bruker 4815 GC Oxygenates Analyzer

Calibration is performed using several concentrations of a multi-component standard mixture with varying measured amounts of each of the oxygenated compound. DME (1,2-dimethoxyethane) is added to each of the calibration mixtures as an internal standard. The system automatically generates a calibration curve for each analyte and computes linearity data. The samples are analyzed, each of the oxygenates are automatically quantified and a results report is printed at the end of each analysis cycle, as shown in Table 1.

Reference ASTM D4815, Standard Test Method for the Determination of MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and C1 to C3 Alcohols in Gasoline by Gas Chromatography; American Society for Testing and Materials, Philadelphia, PA.

The 4815 utilizes Bruker's 450-GC system.

Table 1: Typical repeatability for analysis of 15 consecutive samples.

Peak Area Counts per Target Analyte

Analysis Run Number	ETBE	MTBE	DIPE	TAME	Methanol	Ethanol
1	1091607	1055853	1006944	2723971	2314775	4502637
2	1092548	1056604	1006333	2729622	2314607	4508744
3	1089694	1053480	1003985	2722182	2311682	4504657
4	1075404	1040368	989958	2689793	2288325	4457518
5	1094391	1057769	1008441	2737793	2327095	4521321
6	1082492	1047466	994728	2710139	2302127	4488649
7	1081258	1046027	995978	2706787	2306457	4489523
8	1086955	1051162	1001150	2721315	2321677	4505866
9	1078448	1043422	992506	2701805	2302820	4485725
10	1078209	1043115	992645	2703248	2310069	4485939
11	1097805	1058447	1011330	2745709	2361642	4548321
12	1095479	1058130	1009374	2741334	2344727	4540612
13	1074047	1039164	989716	2691657	2292032	4450770
14	1070283	1035161	984098	2677596	2294149	4452828
15	1074517	1035223	988866	2695103	2292921	4452076
Mean Area Count	1084209.133	1048092.733	998403.4667	2713203.6	2312340.333	4493012.4
Std. Dev.	8971.9	8435.5	8833.6	20479.8	2027.0	30748.1
RSD (%)	0.83	0.80	0.88	0.75	0.87	0.68

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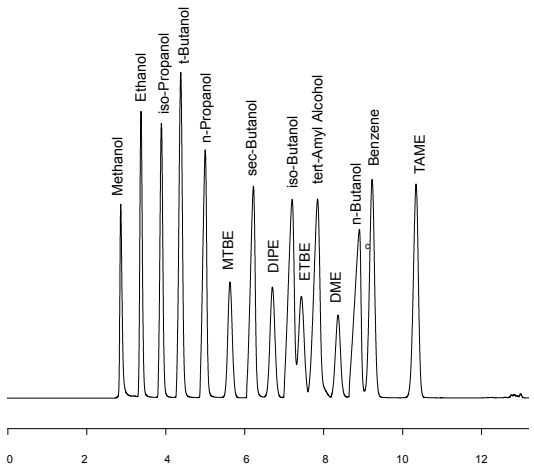
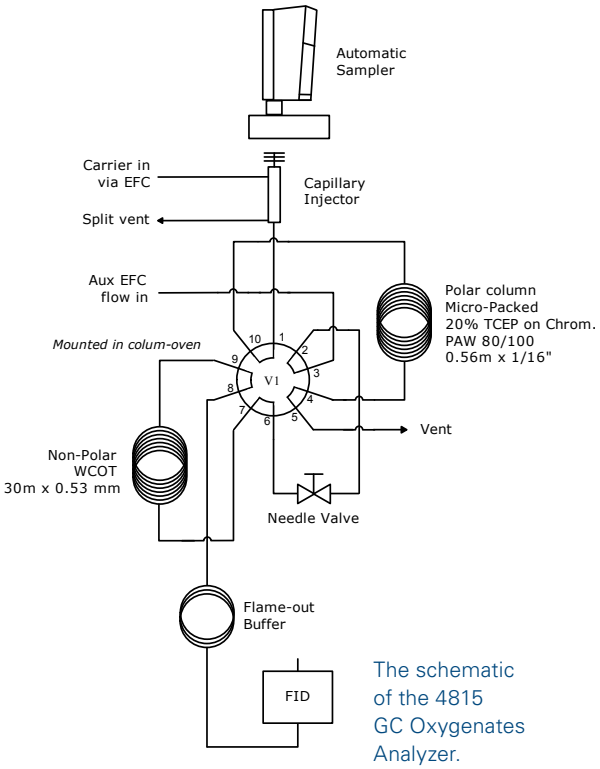
Galaxie™ Hydrocarbon Report
ASTM D4815

System: 103241 Acquired: 21/9/2006 09:08:36
Method: 103241_astm4815 Processed: 10/10/2007 09:54:31
User: Bill Macpherson Printed: 10/10/2007 09:57:49

Sample description: N/A
Chromatogram: 103241_astm4815_21-9-2006 9_07_01_141_channel1





The schematic of the 4815 GC Oxygenates Analyzer.

Peak Report

Index	Time (Min)	Name	Area (µV.Sec)	Quantity (g/l)	Volume (%)
1	2.88	Methanol	13281183.2	7.30	7.76
2	3.39	Ethanol	21207159.1	7.30	7.79
3	3.91	isopropanol	23693528.8	7.30	7.83
4	4.40	tert-Butanol	33903279.7	7.20	7.70
5	5.02	n-Propanol	28492571.8	7.30	7.65
6	5.65	MTBE	15176064.0	4.00	4.54
7	6.24	sec-Butanol	29684299.4	7.30	7.62
8	6.72	DiPE	16193644.0	4.00	4.65
9	7.22	i-Butanol	33914281.2	7.30	7.67
10	7.46	ETBE	16477060.7	3.90	4.43
11	7.87	t-Amyl Alcohol	36553240.2	7.20	7.46
12	8.38	DME	2192221.0	5.99	5.82
13	8.93	n-Butanol	31759056.6	7.29	7.59
14	9.25	Benzene	32670524.5	5.00	3.53
15	10.36	TAME	31550613.7	7.30	7.97
Total			376748727.8	95.67	100.00

Total mass % oxygen report generated using Bruker's Galaxie custom calculation and reporting function.

Chemical Analysis Solutions

GC quadrupole mass spectrometers

The Bruker 300-MS series GC/MS systems stand at the pinnacle of versatility for quadrupole mass spectrometer systems. Both the 300-MS and 320-MS are configurable as either single-quadrupole, or triple-quadrupole systems.

The 300-MS delivers the performance you've come to expect from an industry leader in quadrupole innovation. It features an 800 Da mass range, superior negative ion sensitivity, and unmatched robustness in its performance class. The 320-MS delivers femtogram sensitivity, 2000 Da mass range, and a wide array of chromatographic and ionization configurations to uniquely match your needs - all in less than 72 cm. (28 in.) of linear bench space!

In minutes, our 300-MS series systems can be changed from EI to CI modes of operation. Easily, our 300-MS and 320-MS are the most sensitive, robust, and flexible quadrupole GC/MS systems currently available.

ICP mass spectrometers

Choosing an ICP-MS for your elemental analysis needs has never been easier with the Bruker 800-MS Series. The 810-MS is the instrument of choice for routine analysis with industry leading sensitivity and intuitive Web-integrated ICP-MS Expert software. The 820-MS features Bruker's novel collision reaction interface (CRI), providing interference-free analysis and allowing you to tackle any application with ease. With a vast range of accessories, Bruker has the solution to all your ICP-MS application requirements.

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