APPLICATION NOTE

MultiTek® Sulfur Analysis of Aromatic Hydrocarbons by UVF Detection

- **Fully Automated Combustion System**
- **Rapid and Accurate Determination of Sulfur**
- **ASTM D7183**
- **Sample Versatility**

Keywords:
MultiTek VS, ASTM D7183, vacuum gas oil (VGO), naphtha, p-xylene, benzene, ultra-violet fluorescence (UVF), sulfur, aromatics

INTRODUCTION

Sulfur is commonly looked for in aromatic matrices such as benzene, naphtha, toluene and p-xylene. These compounds are used in refinery processes and daily bench top sample preparations. Sulfur's most significant and costly impact is corrosion. In addition to rust, harmful emissions and catalyst poisoning result which reduces the efficiency of catalytic processes like reforming, isomerization and hydrogenation. All of these push the need to monitor concentrations of sulfur in samples.

The MultiTek is the only instrument on the market that has the ability to determine not only sulfur by UVF(D7183), but, total fluoride and chloride compounds in samples by CIC (D7359) all in one instrument. Sulfur and halides in aromatics by CIC detection can be found here

REACTIONS

- **Sulfur Reaction by UVF**

$$SO_2 + hv' \longrightarrow SO_2^* \longrightarrow SO_2 + hv''$$

The oxidation products after combustion include CO_2, H_2O, NO, SO_2, and various other oxides. The SO_2 is exposed to ultraviolet radiation of a specific wavelength. This radiation is released in the form of sulfur fluorescence.

This fluorescence is detected by a photomultiplier tube and is proportional to the amount of sulfur in the original sample.

The MultiTek complies with ASTM D7183; sulfur in aromatic hydrocarbons, their derivatives and is applicable to samples with sulfur concentrations from 0.5 to 100 mg/kg.

EXPERIMENTAL CONDITIONS

- **Instrumentation**
  Antek MultiTek VS and autosampler

- **Instrument Parameters**

Autosampler Inj Volume (µL)	20
GFC1- Ar/He (ml/min)	130
GFC2- Pyro O_2 (ml/min)	450
GFC4- Carrier O_2 (ml/min)	30
Furnace (ºC)	1050

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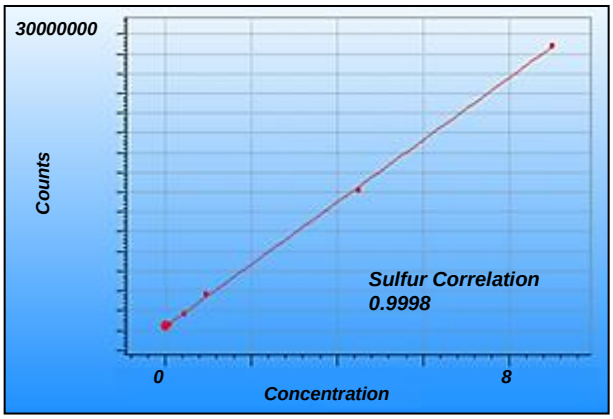
CALIBRATION



- **Standards (0.0 / 0.1 / 0.5 / 0.9 / 4.5 / 9.0 ppm)**

Calibration was performed by directly injecting 20 µl of certified standard materials which were prepared using dibenzothiophene diluted in p-xylene.

- **Limit of Detection**

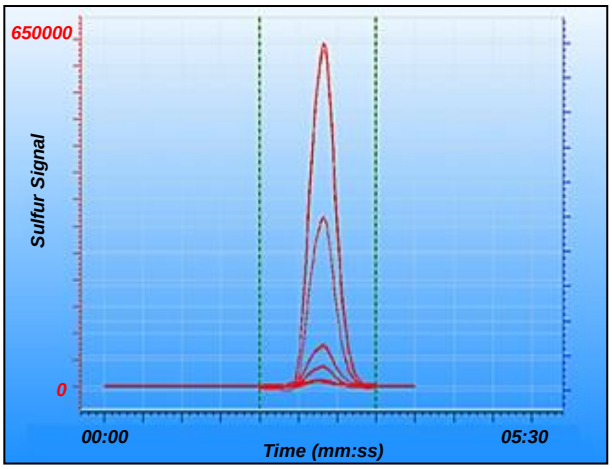
	Sulfur
LOD (ppm)	0.07

Highest quality reagents and gases are required to achieve these LODs. Blank correction required for the low levels of this application.

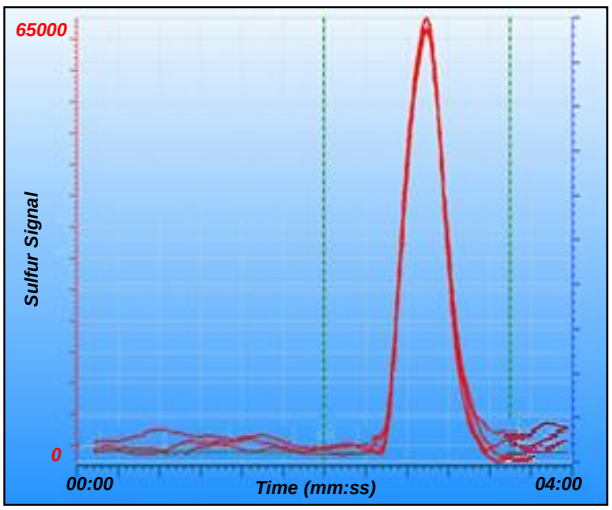
RESULTS

	Counts	Sulfur (ppm)
Naphtha	2564678	0.69
Benzene (x1)	2879933	0.79
Benzene (x2)	3171025	0.88
Benzene (x3)	3177863	0.88
Benzene (x4)	2959411	0.82
AVG Benzene	3047058	0.85
	% RSD Benzene	4.94

PEAK ANALYSIS



Calibration Overlay



4 replicates of Benzene Sample

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CONCLUSION

The results demonstrate that the MultiTek Analyzer provides a sensitive, automated and reliable elemental analysis of aromatic hydrocarbon compounds. This analysis will help optimize refinery and quality control processes by monitoring these components.

Anteks MultiTek® is the only instrument on the market that combines testing sulfur, nitrogen, and halides all in one. Compact, powerful, automated, and multi-configurable, it's the perfect solution to today's increasing demand worldwide for fast, accurate detection and the analysis of unwanted chemicals, pollutants, contaminants, and corrosive elements. Because MultiTek® delivers precise results with high sensitivity and unmatched versatility, it's a valuable process optimization tool that will deliver faster ROI and a better bottom line.

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