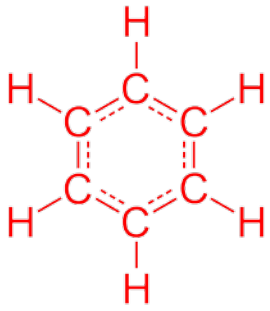
# Measuring Aromatic Hydrocarbons (BTX)

Applied Analytics Application Note No. AN-007



**Application Summary**

Analytes: aromatic hydrocarbons (benzene, toluene, xylene, etc.)

Detector: OMA-300 Process Analyzer

**Introduction**

Aromatic hydrocarbons like benzene, toluene, and xylene are carcinogenic compounds. This has implications for a wide range of industrial processes: aromatic hydrocarbon emissions are highly regulated, and products like fuel, glue, detergents, and various solvents are required to meet a specified maximum level of aromatic content.

Fortunately, aromatic hydrocarbons have strong absorbance in the UV range and can be easily measured through spectroscopic methods. The laboratory standard ASTM method D1017-51 uses UV spectroscopy for aromatic hydrocarbon analysis; the OMA system takes the same principle and brings it to the field for continuous, fast-response analysis on site.

Using a dispersive UV-Vis spectrophotometer, the OMA continuously measures absorbance at each integer wavelength in the 200-300 nm range — the spectral region in which common aromatic hydrocarbons have very prominent, distinct absorbance curves. This allows the OMA to easily differentiate the absorbance of each compound from the total sample absorbance.

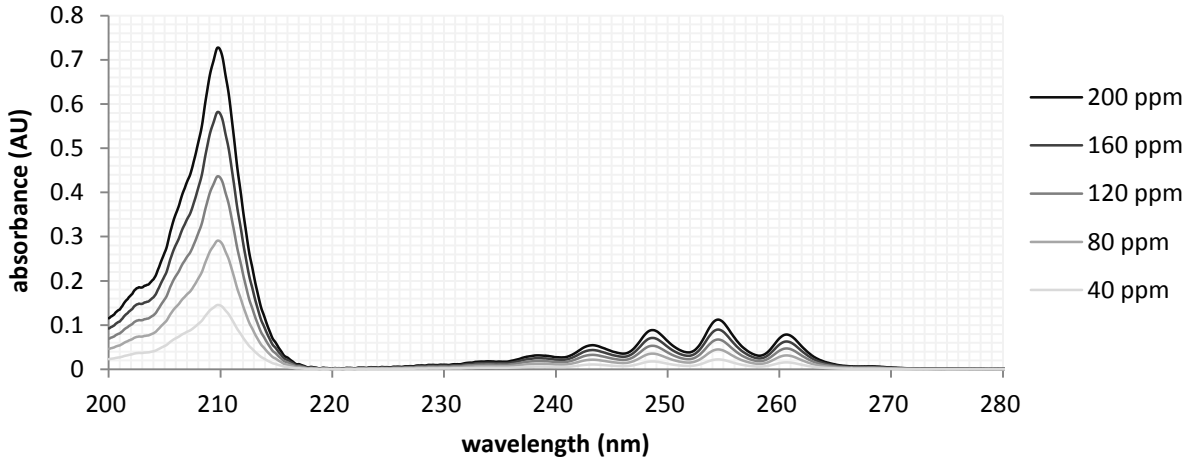
**OMA Benefits**

- Continuously measures aromatic hydrocarbon concentrations using dispersive UV-Vis absorbance spectroscopy
- Totally solid state build with no moving parts — modern design for low maintenance
- Ultra-safe fiber optic design with dedicated sample flow cell — no toxic/corrosive sample fluid in analyzer enclosure
- Additional software benches available for additional measured chemicals (up to 5 total)
- Excellent dynamic range due to photodiode array — no error due to absorbance saturation
- Decades of field-proven performance in industrial and environmental applications

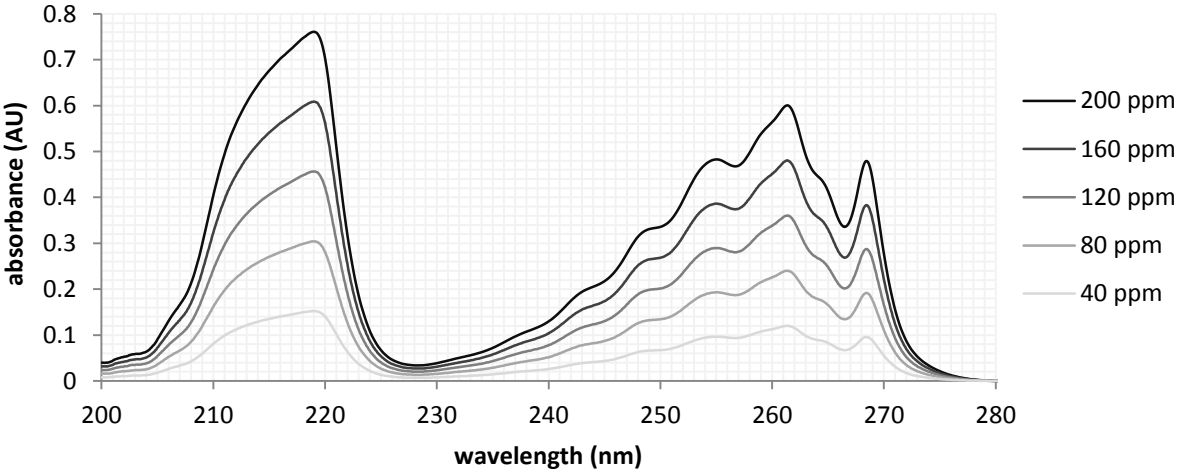
**Aromatic Hydrocarbons' Absorbance Curves**

The OMA system is calibrated on standard samples (known concentrations) of each analyte in order to learn the distinctive absorbance curve of each analyte (benzene, toluene, xylene) as illustrated below:

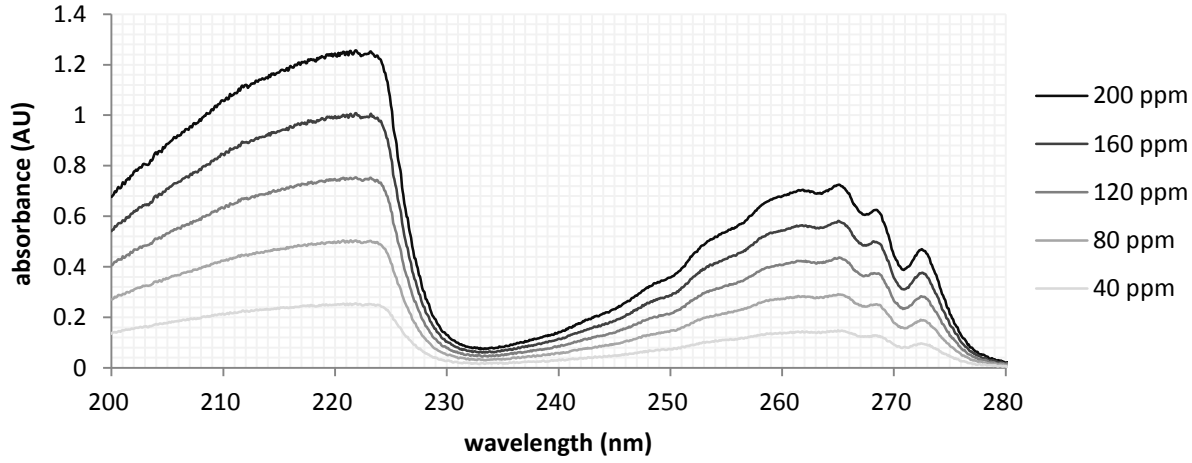
benzene




toluene

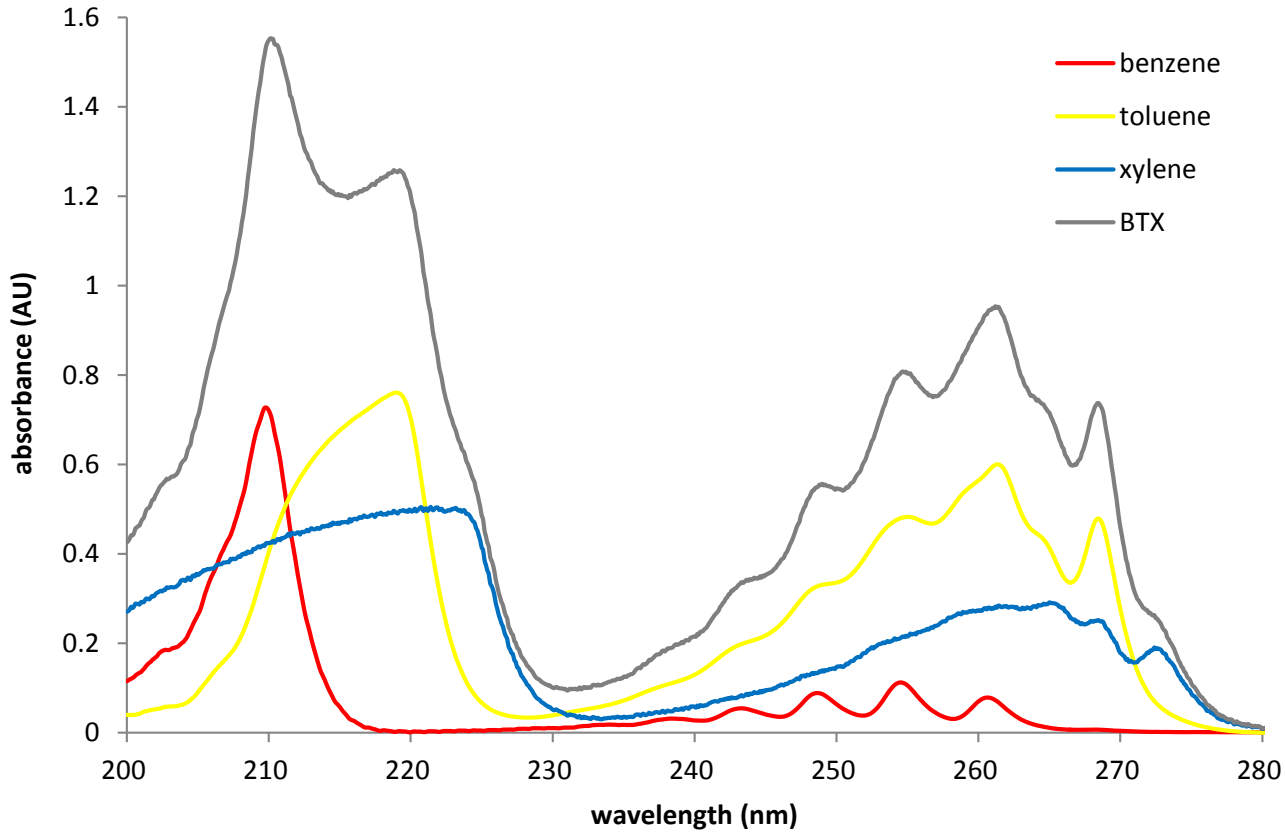



xylene



**Measuring BTX or Total Aromatics**

The OMA system uses a multi-component analysis algorithm which harvests the rich data of dispersive UV spectrophotometry in order to easily measure multiple analytes with overlapping absorbance curves. The absorbance measurements at each integer wavelength feed into a matrix of equations continuously solved by the proprietary ECLIPSE software; the absorbance curve of each analyte is de-convoluted from the total sample absorbance.




Measuring up to 5 total analytes simultaneously, the OMA provides the flexibility to add or remove analytes at any time via simple software procedures.

**Replicating Laboratory/Conventional Methods**

The standard lab procedure for measurement of aromatic hydrocarbons in low olefin stocks requires baseline subtraction by drawing a line from the 240-250 nm valley to a point tangent to the curve at the lowest point within the 300-320 nm range. The area under this baseline is subtracted to produce a new baseline-normalized absorbance curve. The peak absorbance within the 265-280 nm range is then correlated to concentration.

This method can easily be implemented in ECLIPSE software as an alternative to the standard (full-spectrum) correlation. The OMA is designed to seamlessly replace/automate existing analysis methods per exact user requirements.

**Example Installation**

The OMA system pictured below measures benzene concentration (0-100 ppm) in an LNG stream.

The specifications below represent performance of the OMA-300 Process Analyzer in a typical BTX application.

For technical details about the OMA-300 Process Analyzer, see the data sheet:
http://www.a-a-inc.com/documents/AA_DS001A_OMA300.pdf

All performance specifications are subject to the assumption that the sample conditioning system and unit installation are approved by Applied Analytics. For any other arrangement, please inquire directly with Sales.



| Application Data | | | |
|---|---|---|---|
| **Performance Specifications** | | | |
| Accuracy | *Custom measurement ranges available; example ranges below.* | | |
| | **benzene** | in gas | 0-50 ppm: ±2 ppm<br>0-100 ppm: ±1% full scale<br>0-10,000 ppm: ±1% full scale |
| | | in liquid | 0-10 ppm: ±0.5 ppm<br>0-100 ppm: ±1% full scale<br>0-1%: ±1% full scale |
| | **toluene** | in gas | 0-50 ppm: ±2 ppm<br>0-100 ppm: ±1% full scale<br>0-10,000 ppm: ±1% full scale |
| | | in liquid | 0-10 ppm: ±0.5 ppm<br>0-100 ppm: ±1% full scale<br>0-1%: ±1% full scale |
| | **xylene** | in gas | 0-50 ppm: ±2 ppm<br>0-100 ppm: ±1% full scale<br>0-10,000 ppm: ±1% full scale |
| | | in liquid | 0-10 ppm: ±0.5 ppm<br>0-100 ppm: ±1% full scale<br>0-1%: ±1% full scale |

**Further Reading**

| Subject | Location |
|---|---|
| OMA-300 Process Analyzer<br>Data sheet | http://www.a-a-inc.com/documents/AA_DS001A_OMA300.pdf |
| Advantage of Collateral Data<br>Technical Note | http://www.a-a-inc.com/documents/AA_TN-202_CollateralData.pdf |
| Multi-Component Analysis<br>Technical Note | http://www.a-a-inc.com/documents/AA_TN-203_MultiComponentAnalysis.pdf |



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