

Environmental Analysis of BTEX Compounds in Soil, Water and Sludge by GC / PID

Because of the widespread use and history of indiscriminate disposal practices of gasoline and fuel oils, their analysis in environmental samples is in high demand. Gasoline and diesel are both complex mixtures containing up to 400 individual compounds. The BTEX group (Benzene, Toluene, Ethylbenzene, and the Xylenes) are naturally occurring constituents of gasoline and diesel (although also present in kerosenes and fuel oils), and their analysis simplifies the identification of these sources.

The analysis is performed using a purge and trap device which, owing to differences in volatility and water insolubility, easily separates the BTEX group from the complex sample matrix. In addition, the analytes are identified with a photo-ionization detector (PID) which responds selectively to aromatic hydrocarbons while showing only a small or negative response to paraffins, oxygenated hydrocarbons and other gas components. Hence the BTEX analysis is not only one of the most commonly requested, but also a fairly simple, straightforward method.

Because of the selectivity of the PID, expensive test methods such as GC-MS are not necessary. This method is readily performed on-site using a Buck model 300 gas chromatograph equipped with a built-in purge and trap and PID, or in the laboratory with the Buck model 910.

Since the PID is nondestructive, it is often run in series with the flame ionization detector (FID). This allows the analyst to identify the BTEX components, as well as fingerprint the source of contamination by simultaneously analyzing the light hydrocarbon range. The FID is also used when analyzing high concentration samples (>750ppb) as shown in the chromatogram on the back).

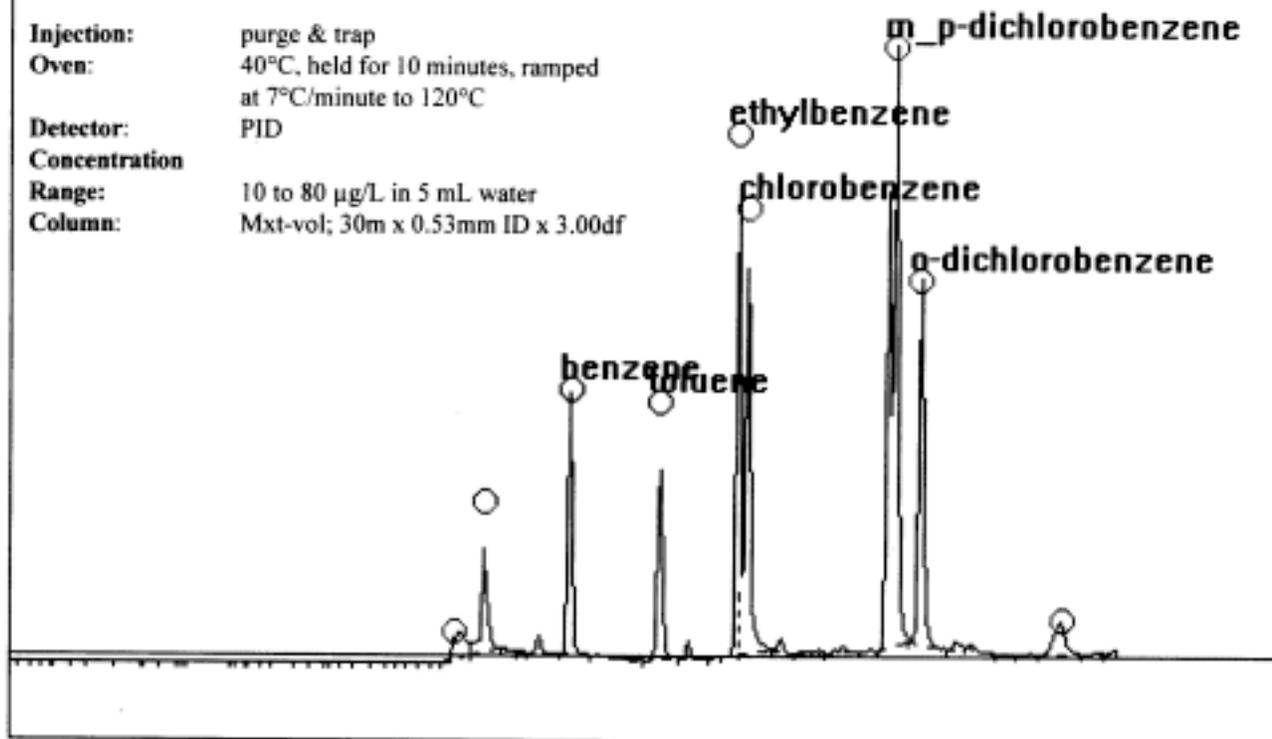
The detection limits with the PID are shown below, clearly demonstrating the utility and sensitivity of the Buck gas chromatograph. Examples of the chromatograms and analytical conditions shown on the back.

Analyte	P.P.M.
Benzene	0.0002
Toluene	0.0002
Ethylbenzene	0.0002
Chlorobenzene	0.0002
1,4-Dichlorobenzene	0.0003
1,3-Dichlorobenzene	0.0004
1,2-Dichlorobenzene	0.0004
Total Xylenes	0.0015

Analyst: Kevin Attra

Results of a BTEX analysis

Injection: purge & trap
Oven: 40°C, held for 10 minutes, ramped at 7°C/minute to 120°C
Detector: PID
Concentration Range: 10 to 80 µg/L in 5 mL water
Column: Mxt-vol; 30m x 0.53mm ID x 3.00df



Detector Specifications

Photo Ionization:

Sensitivity: 18.02mV . sec / pg as Benzene
Detection Limit: 0.04mg . L-1 as Benzene
Linear Range: 105

Flame Ionization:

2.60mV . sec / ng as Benzene
380mg . L-1 as Benzene
107

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