

ON-LINE ANALYSIS OF AROMATIC HYDROCARBONS IN PROCESS WATER

INTRODUCTION

Aromatic Hydrocarbons such as benzene and its derivatives, toluene and xylene often referred as BTX are used as starting materials in a multitude of products from pharmaceuticals, dyes, polymers to agrochemicals.

These aromatics are known to cause health effects from chronic exposure and even benzene is listed as a cancer causing substance. In production processes cooling water and condensed water can become contaminated with these compounds. It is therefore necessary to have reliable and fast methods to determine and control the amount of these compounds as well as effective methods for treatment and removal.

Gas chromatography is the most commonly used method for measurement. However, there is demand for alternative methods utilising fast on-line analysis with lower running costs.

THE METHOD

Aromatic hydrocarbons show good absorption characteristics in UV-VIS region due to the high level of conjugated bonds present. Figure 1 gives an example of different concentrations of a benzene, toluene, xylene mixture in water.

A method using absorbance characteristic of aromatics in the region 190–300 nm was developed to measure these compounds in the ppm range.

A PLS algorithm is used to determine the concentration of individual and total aromatics.

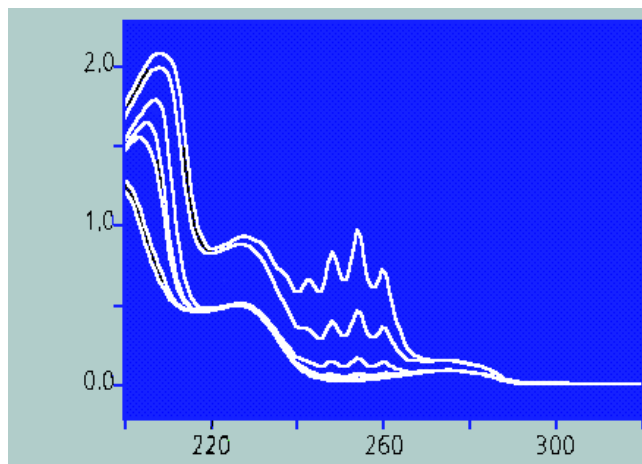


Figure 1: BTX solvents



Figure 2: LabView screenshot



THE SYSTEM

The industrial diode array system MCS 500 UV based on the established ZEISS MCS polychromator technology provides the spectral information in the UV range required for the developed method.

High sensitivity, high wavelength stability and low straylight guarantee excellent reliability of the determined values. Pre-aligned flow cell, 2-channel plug-in multiplexer to measure two streams or sample/reference, industrial standard outputs (RS 422, 4-20 mA) and an easy-to-use on-line software package complete the system.

Systems can be cascaded and controlled via one Host PC to measure compounds in different streams.

THE SOFTWARE

The DM1 software package is designed to run under WINDOWS®NT and includes the PLS/IQ module from GALACTIC to work with any PLS model designed under GRAMS 5.

The program allows to display the results of up to 4 channels including the measured absorbance spectra.

Concentrations of the compounds can be displayed, saved and/or sent via analog output.

Digital controlled devices like valves, shutter etc. to switch streams or references can be included in the automated signal processing.

THE BENEFITS

- ◆ Analysis and response time greatly reduced
- ◆ Fast and continuous monitoring
- ◆ Established and proved system and method
- ◆ High reliability, low maintenance
- ◆ Easy to use software
- ◆ Speed and full spectrum advantage of photodiode array detection
- ◆ Possibility to combine systems to monitor various streams
- ◆ Fiber optics allow flexibility in installation and location of the system

SYSTEM SPECIFICATIONS

Wavelength range	200 – 620 nm (190–1020 nm optional)
Wavelength resolution	0,8 nm/diode (2,4 nm Rayleigh)
Wavelength reproducibility	< 0,05 nm
Measurement time	< 2s
PC Interface	RS422
Distance between PC and System	up to 80 m with standard cable Up to 2,5 km with waveguide transmission
Analog output (4 – 20 mA)	4 channels (standard) NI PC ISA card
Optical Fiber (Probes-System)	Quartz, 600 µm core, SMA Maximum distance 10 m
Housing	19" slide-in rack 19" protective housing