



Volatil organic compounds in water by purge and trap/capillary column GC with photoionization and electrolytic conductivity detectors in series

Application Note

Environmental

Authors

Agilent Technologies, Inc.

Introduction

The 1986 amendments to the Safe Drinking Water Act require the determination of eight newly regulated Volatile Organic Compounds (VOCs) in addition to the trihalomethanes, and the monitoring of fifty-one other VOCs in finished drinking water, raw source water, or drinking water in any treatment stage. This analysis is performed using EPA Method 502.2.

The VOCs are purged and subsequently trapped on a Tenax-silica gel-charcoal trap, as in the Method 601*, but after desorption the analysis is carried out on a capillary column and the VOCs are detected on a Photoionization Detector (aromatics) connected to an Electrolytic Conductivity Detector (halocarbons) in series. The 624-type (0.53 mm x 30 m, 3 μ L film) or CP-Select 624 CB column provides improved resolution of the many VOCs and also ensures lower detection limits than was attainable with the packed column. Figure 1 shows a dual channel chromatogram of selected VOCs.



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Peak identification

- | | |
|----------------------------|-------------------------------|
| 1. dichlorodifluoromethane | 20. toluene |
| 2. chloromethane | 21. T-1,3-dichloropropene |
| 3. vinyl chloride | 22. 1,1,2-trichloroethane |
| 4. bromomethane | 23. tetrachloroethene |
| 5. chloroethane | 24. dibromochloromethane |
| 6. trichlorofluoromethane | 25. chlorobenzene |
| 7. 1,1-dichloroethene | 26. ethylbenzene |
| 8. methylene chloride | 27. m/p-xylene |
| 9. T-1,2-dichloroethene | 28. o-xylene |
| 10. 1,1-dichloroethane | 29. bromoform |
| 11. chloroform | 30. 1,1,2,2-tetrachloroethane |
| 12. 1,1,1-trichloroethane | 31. bromobenzene |
| 13. tetrachloromethane | 32. p-chlorotoluene |
| 14. benzene | 33. 1,3-dichlorobenzene |
| 15. 1,2-dichloroethane | 34. 1,4-dichlorobenzene |
| 16. trichloroethene | 35. 1,2-dichlorobenzene |
| 17. 1,2-dichloropropane | 36. 1,2,4-trichlorobenzene |
| 18. bromodichloromethane | 37. hexachlorobutadiene |
| 19. C-1,3-dichloropropene | |

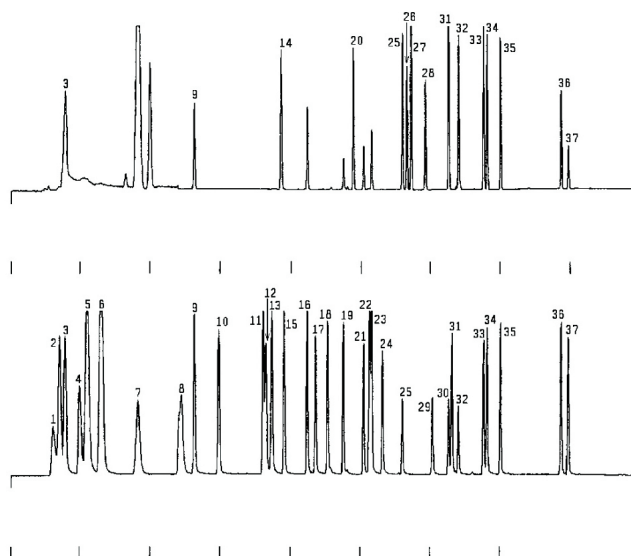


Figure 1. The Analysis of Volatile Organic Compounds Employing a 624-type Column and PID/ELCD Detectors

The chromatograms shown in Figures 1 and 3 were obtained using the column selector. Different retention times on the 624-type columns, and in a few cases reversed elution orders help provide positive identification by two column confirmation. Additional confirmatory information can be acquired for some compounds by result ratioing of VOCs which respond to both detectors, for example, halogenated aromatic and unsaturated compounds. The result ratio of 1 indicates the presence of these dual detected contaminants.

The column selector system is fully automatic in the sequence mode allowing unattended operation. Blank, calibration, and analysis runs may be executed first with the primary column and then with the confirmatory column.

Conditions

Column : 6% cyanopropylphenyl 94% methyl,
0.53 mm x 30 m, 3 µm

Oven : 10 °C/10 min, 5 °C/min to 160 °C/0 min

Carrier Gas : Helium, 6.0 mL/min

Trap : Tenax/Silica Gel/Charcoal, 11 min purge

Concentration : 20 ppb each component

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| 8. methylene chloride | 27. m/p-xylene |
| 9. T-1,2-dichloroethene | 28. o-xylene |
| 10. 1,1-dichloroethane | 29. bromoform |
| 11. chloroform | 30. 1,1,2,2-tetrachloroethane |
| 12. 1,1,1-trichloroethane | 31. bromobenzene |
| 13. tetrachloromethane | 32. p-chlorotoluene |
| 14. benzene | 33. 1,3-dichlorobenzene |
| 15. 1,2-dichloroethane | 34. 1,4-dichlorobenzene |
| 16. trichloroethene | 35. 1,2-dichlorobenzene |
| 17. 1,2-dichloropropane | 36. 1,2,4-trichlorobenzene |
| 18. bromodichloromethane | 37. hexachlorobutadiene |
| 19. C-1,3-Dichloropropene | |

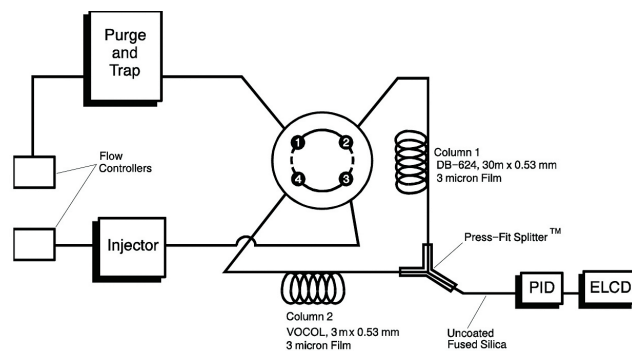


Figure 2. Column Selector for VOC Analysis

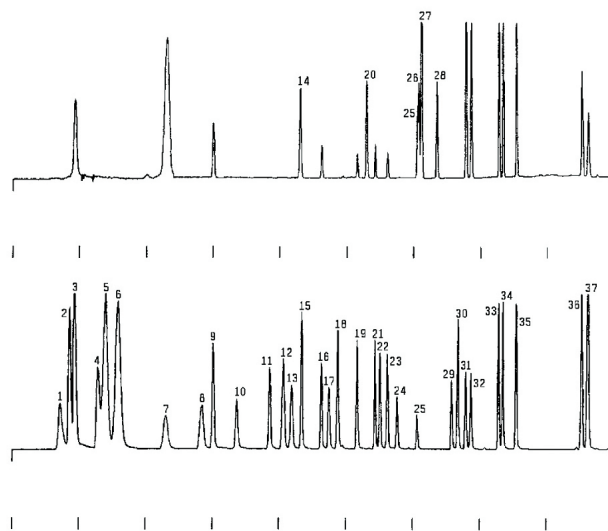


Figure 3. The Analysis of Volatile Organic Compounds optimized Column and PID/ELCD Detectors

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