

Gas Chromatography

Capillary Column

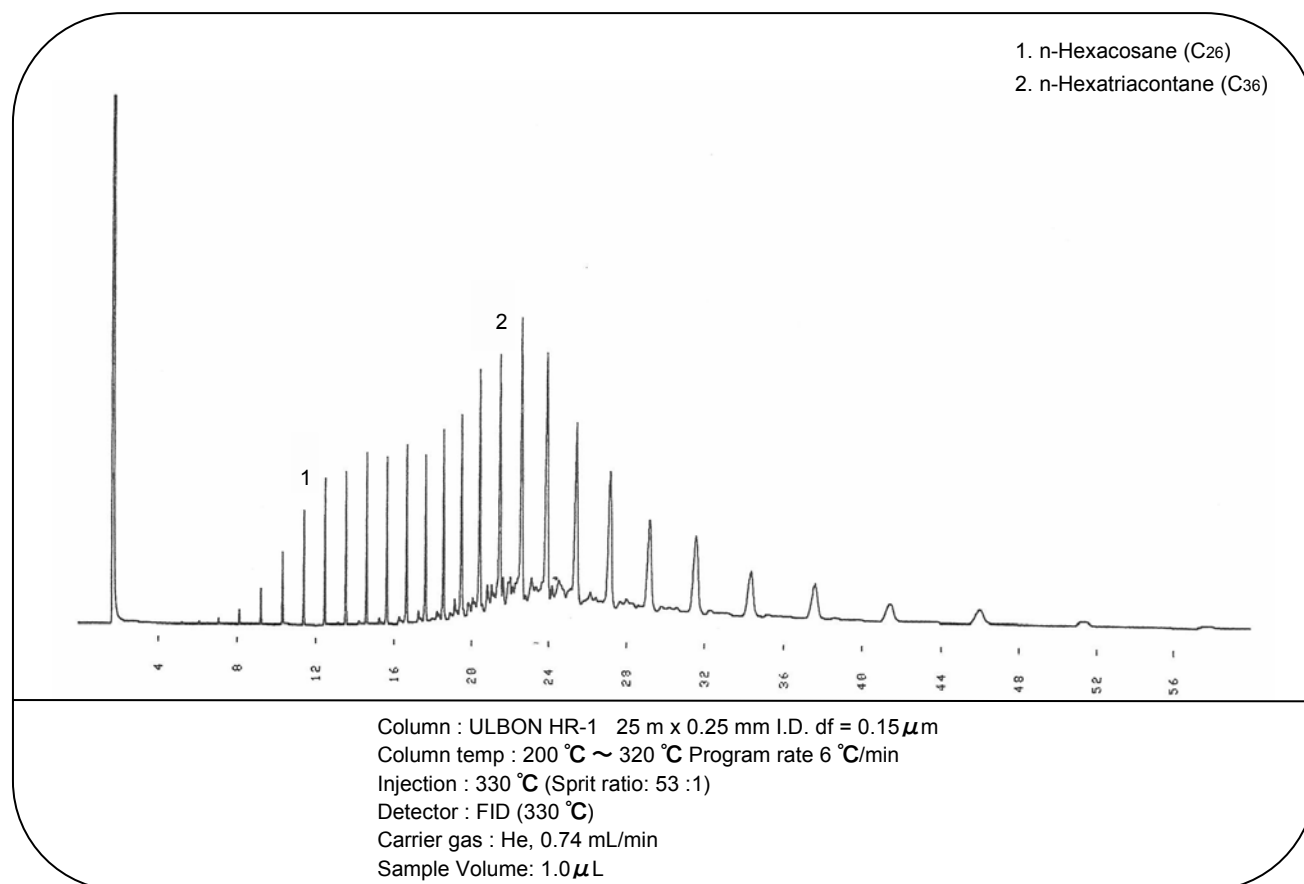
Application Data



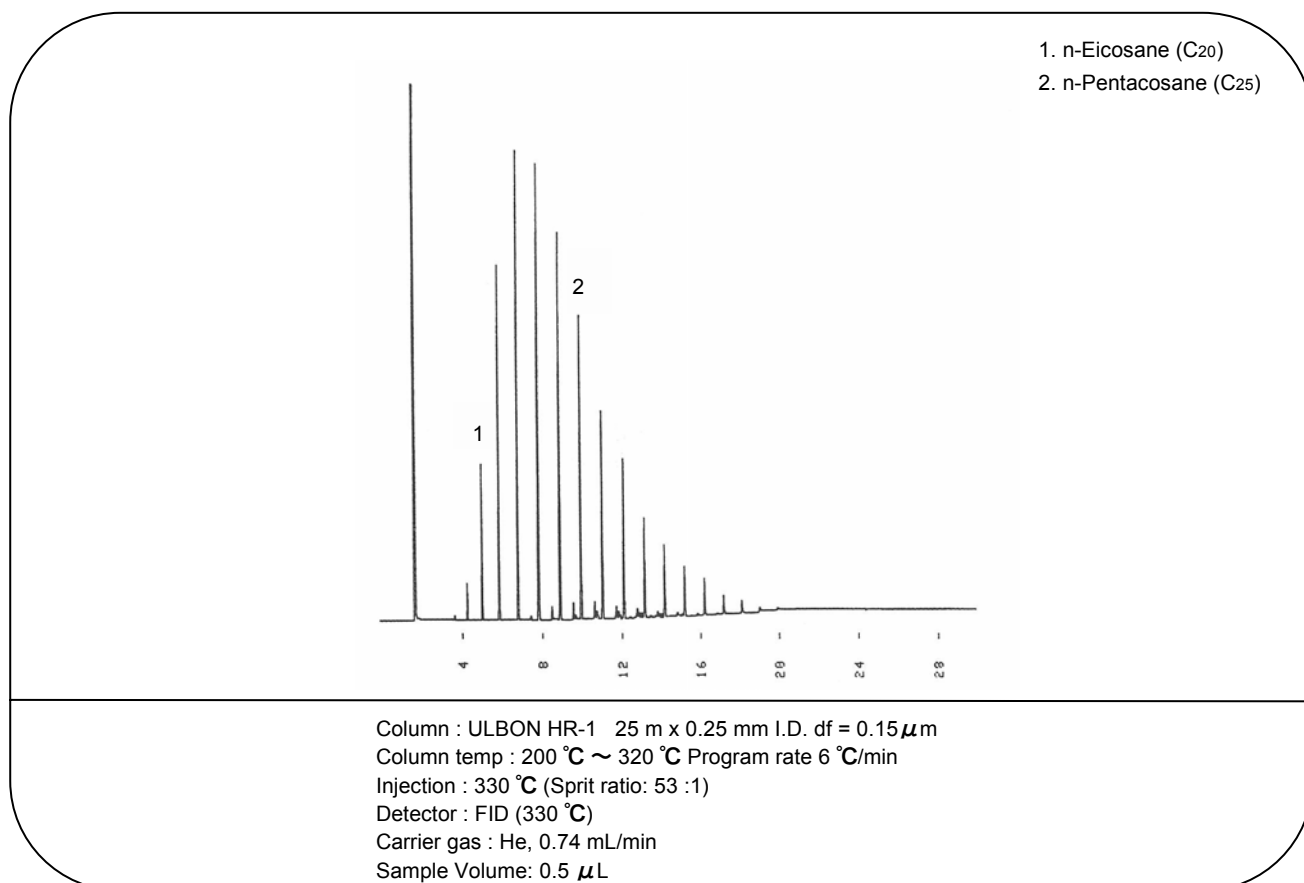
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Hydrocarbons

Paraffin wax (m.p. 68 ~ 70 °C)



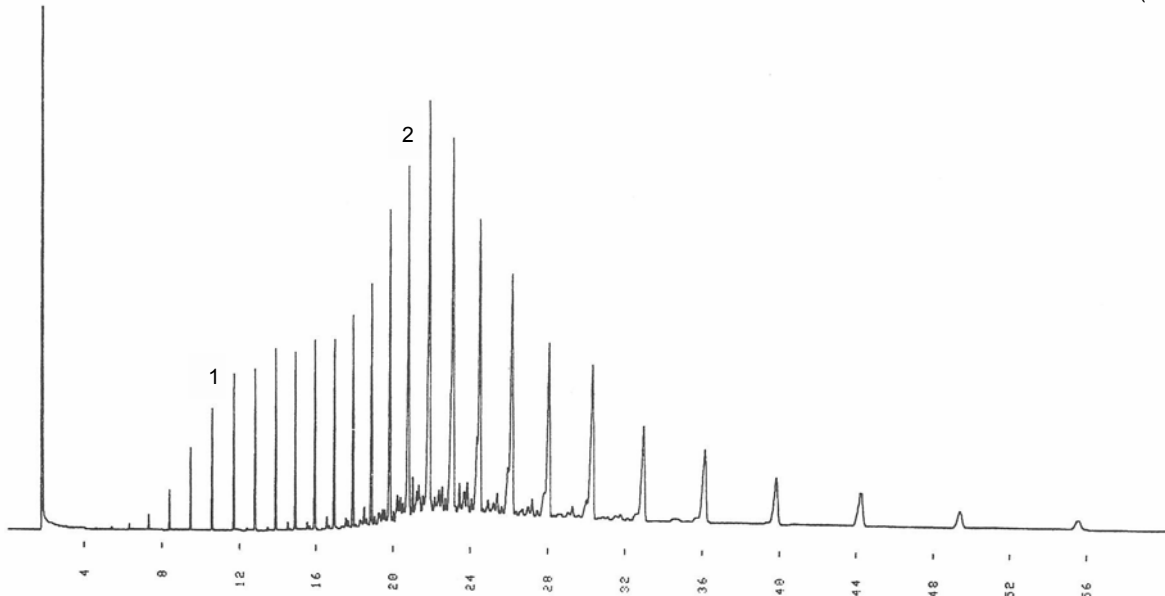
Paraffin wax (m.p. 48 ~ 50 °C)



Hydrocarbons

Paraffin wax (m.p. 68 ~ 70 °C)

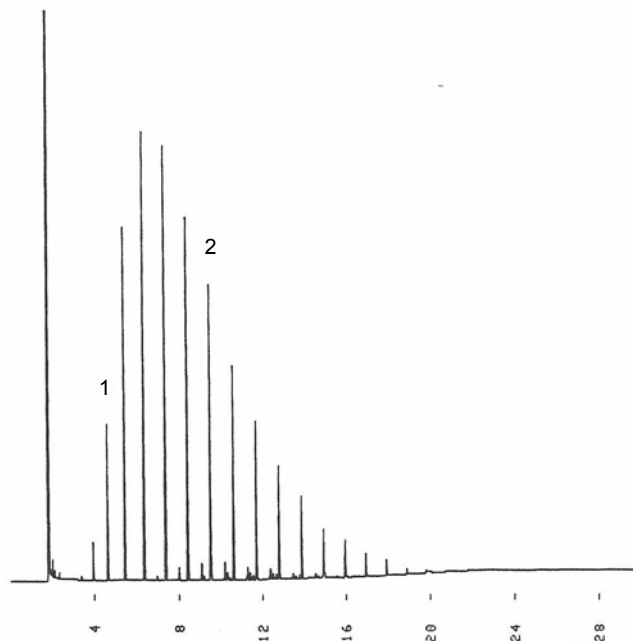
1. n-Hexacosane (C₂₆)
2. n-Hexatriacontane (C₃₆)



Column : ULBON HR-52 25 m x 0.25 mm I.D. df = 0.15 μ m
Column temp : 200 °C ~ 320 °C Program rate 6 °C/min
Injection : 330 °C (Split ratio: 56 : 1)
Detector : FID (330 °C)
Carrier gas : He, 0.7 mL/min
Sample Volume: 1.0 μ L

Paraffin wax (m.p. 48 ~ 50 °C)

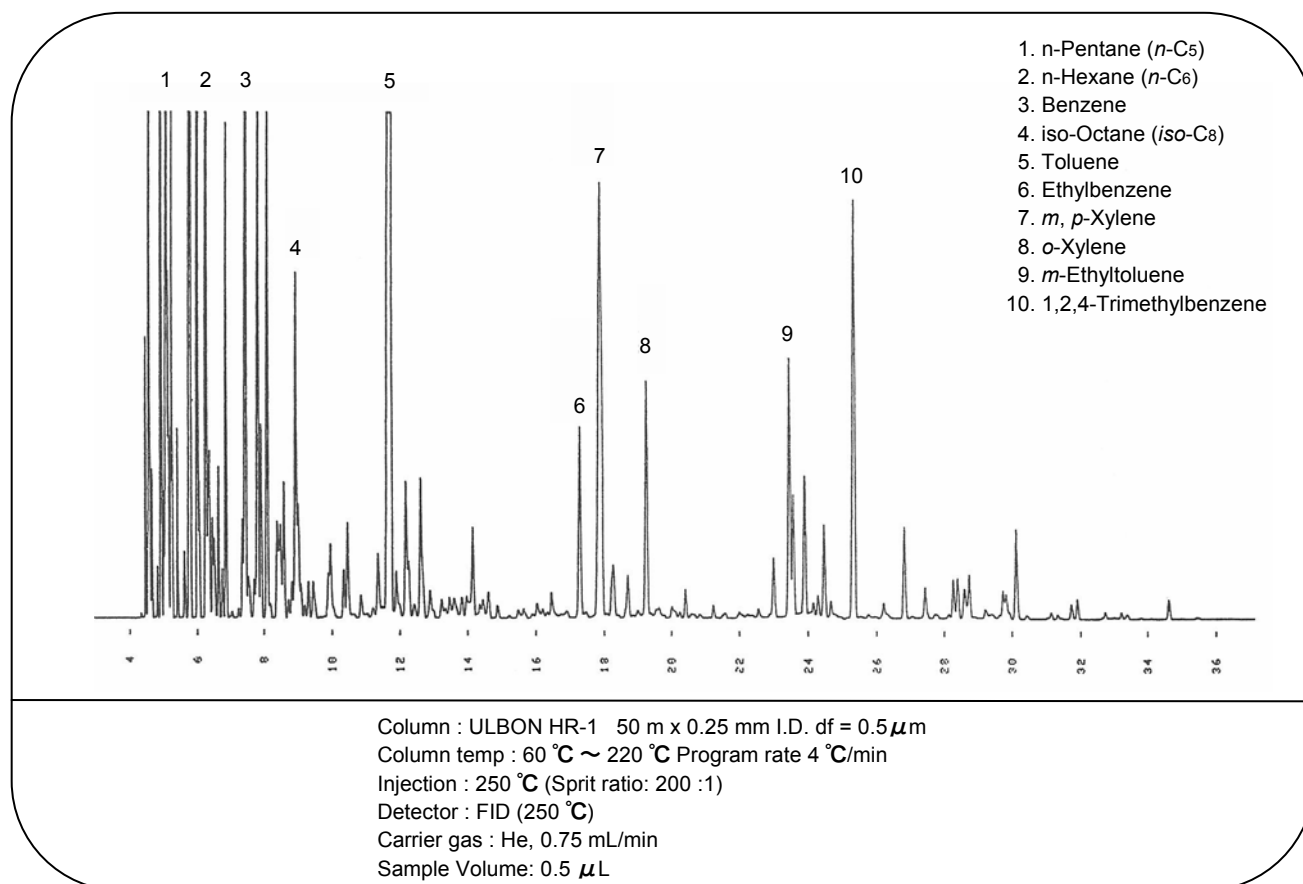
1. n-Eicosane (C₂₀)
2. n-Pentacosane (C₂₅)



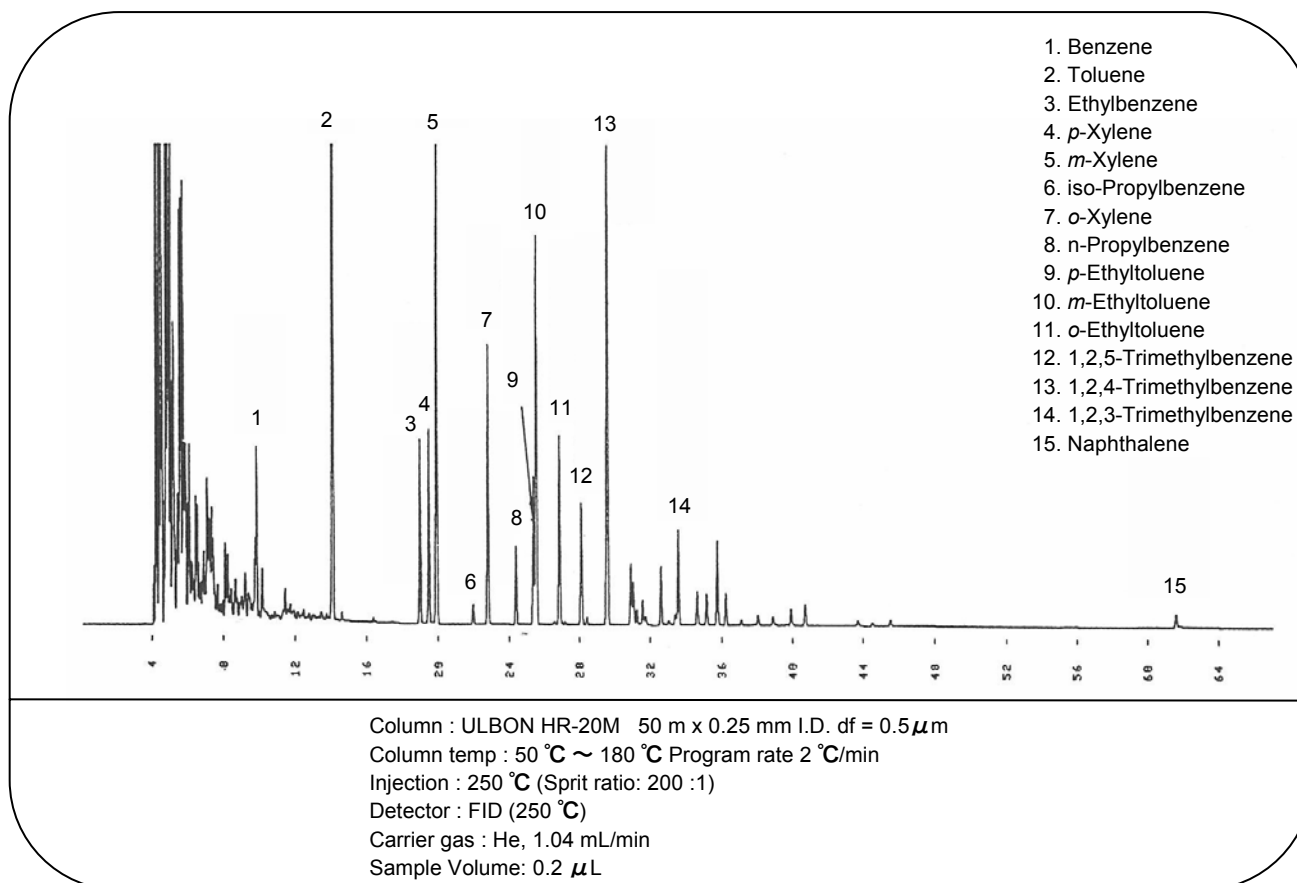
Column : ULBON HR-52 25 m x 0.25 mm I.D. df = 0.15 μ m
Column temp : 200 °C ~ 320 °C Program rate 6 °C/min
Injection : 330 °C (Split ratio: 56 : 1)
Detector : FID (330 °C)
Carrier gas : He, 0.7 mL/min
Sample Volume: 0.5 μ L

Hydrocarbons

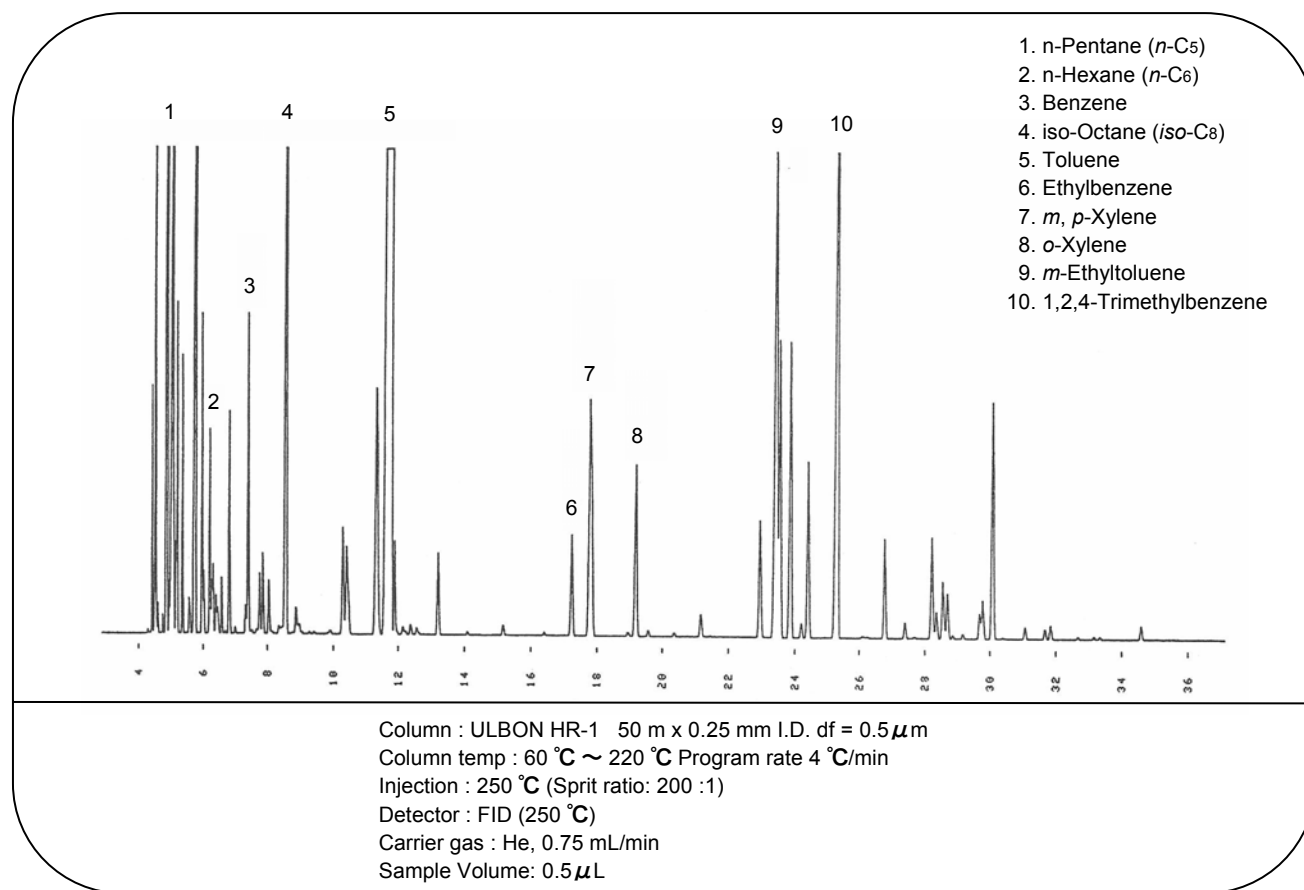
Regular gasoline



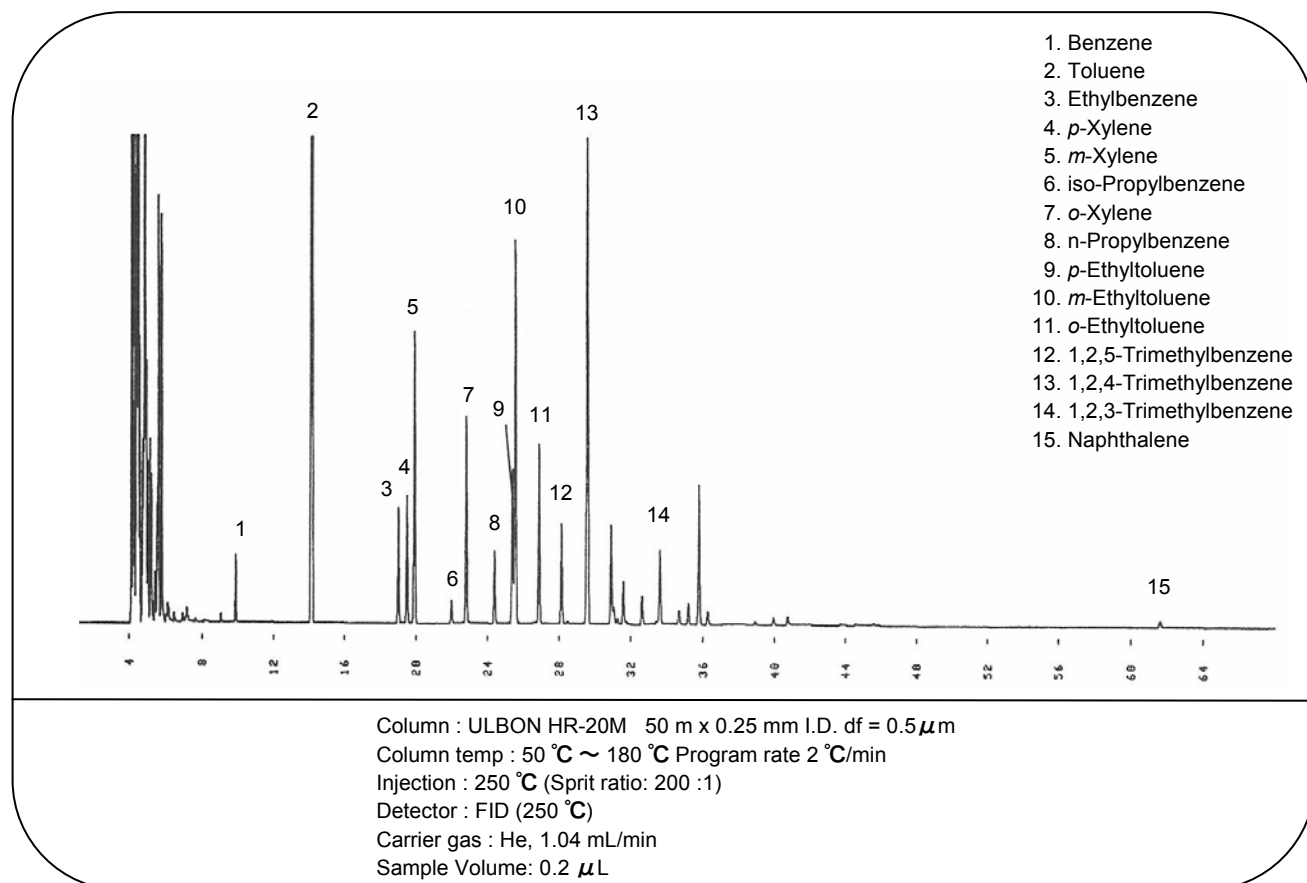
Aromatic hydrocarbons in Regular gasoline



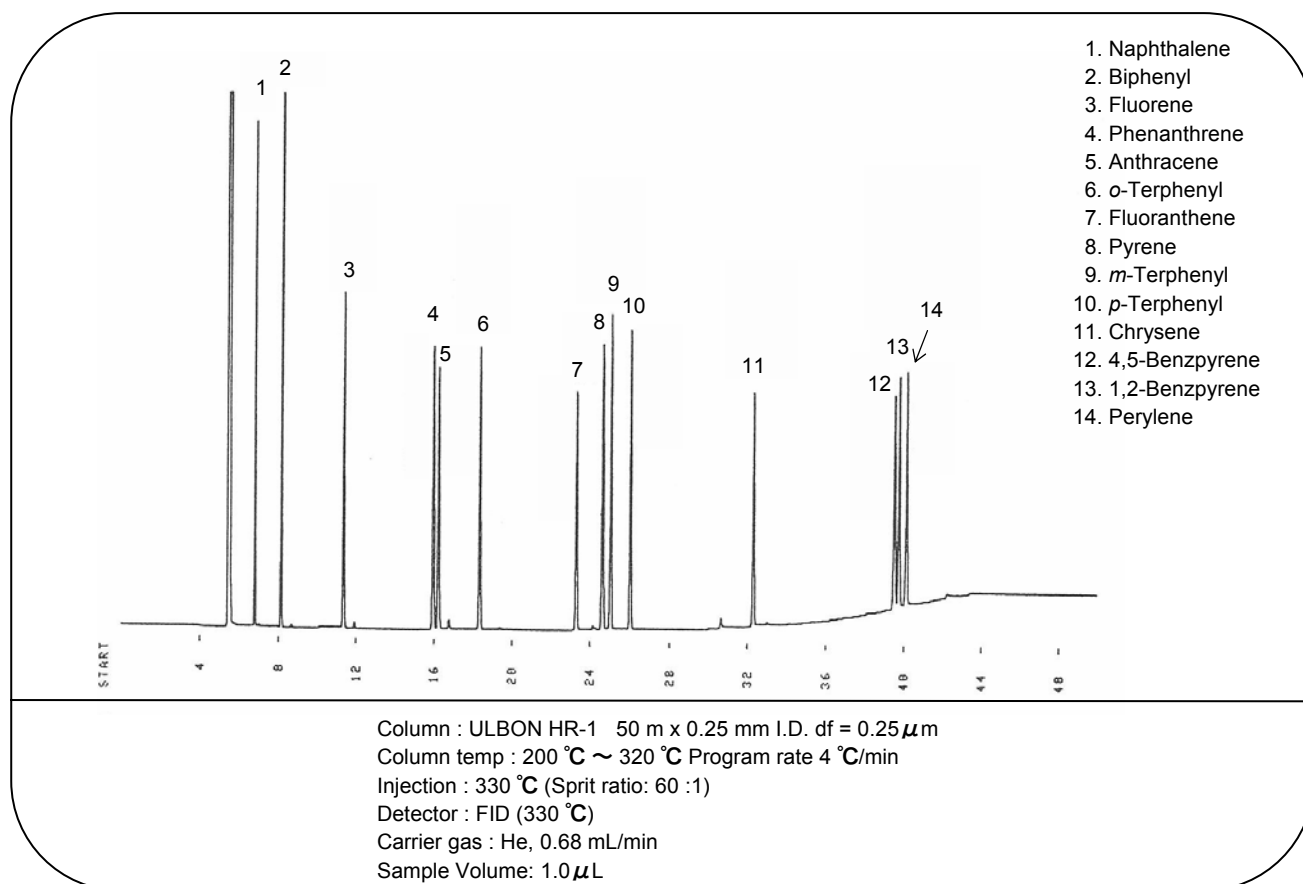
Premium gasoline



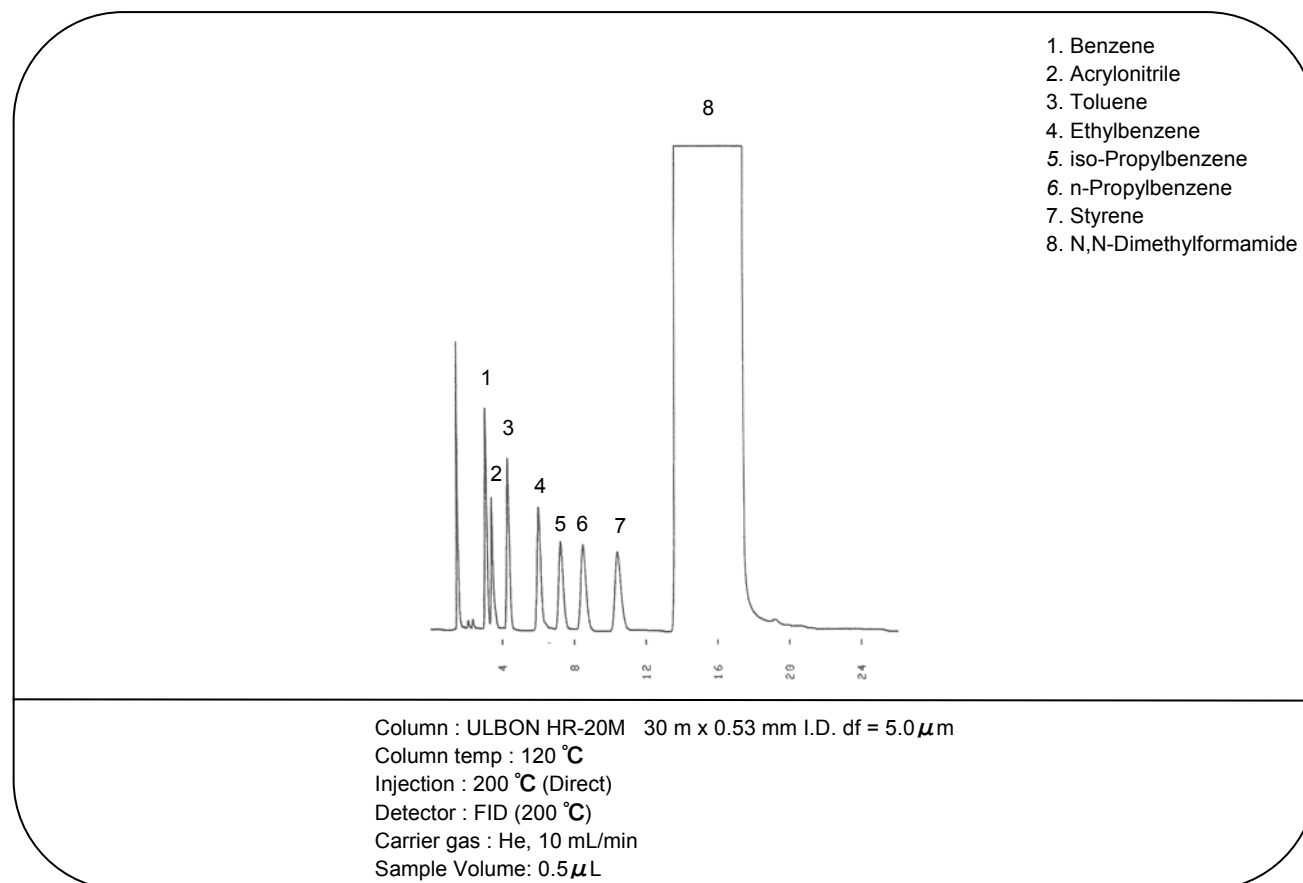
Aromatic hydrocarbons in Premium gasoline



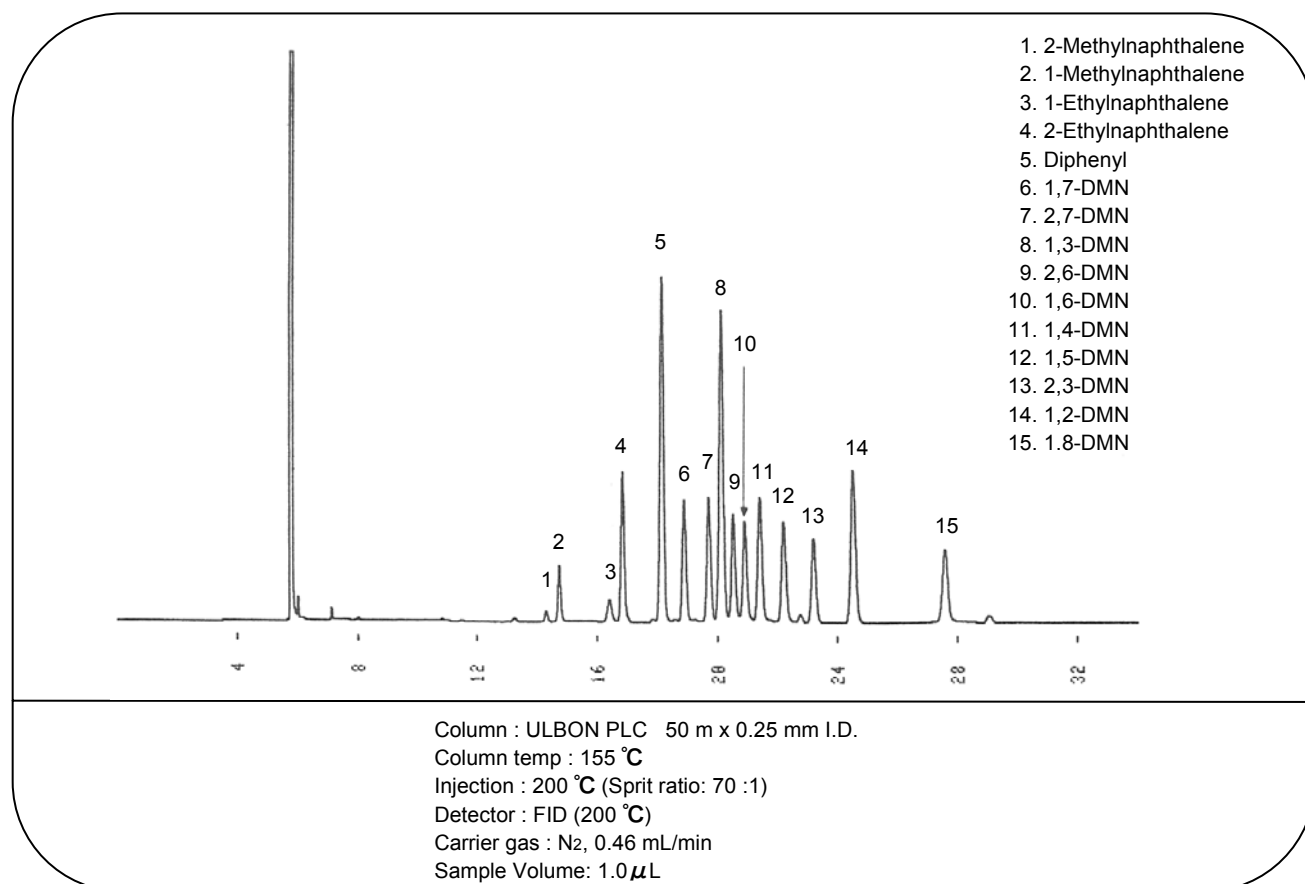
Polycyclic aromatic hydrocarbons



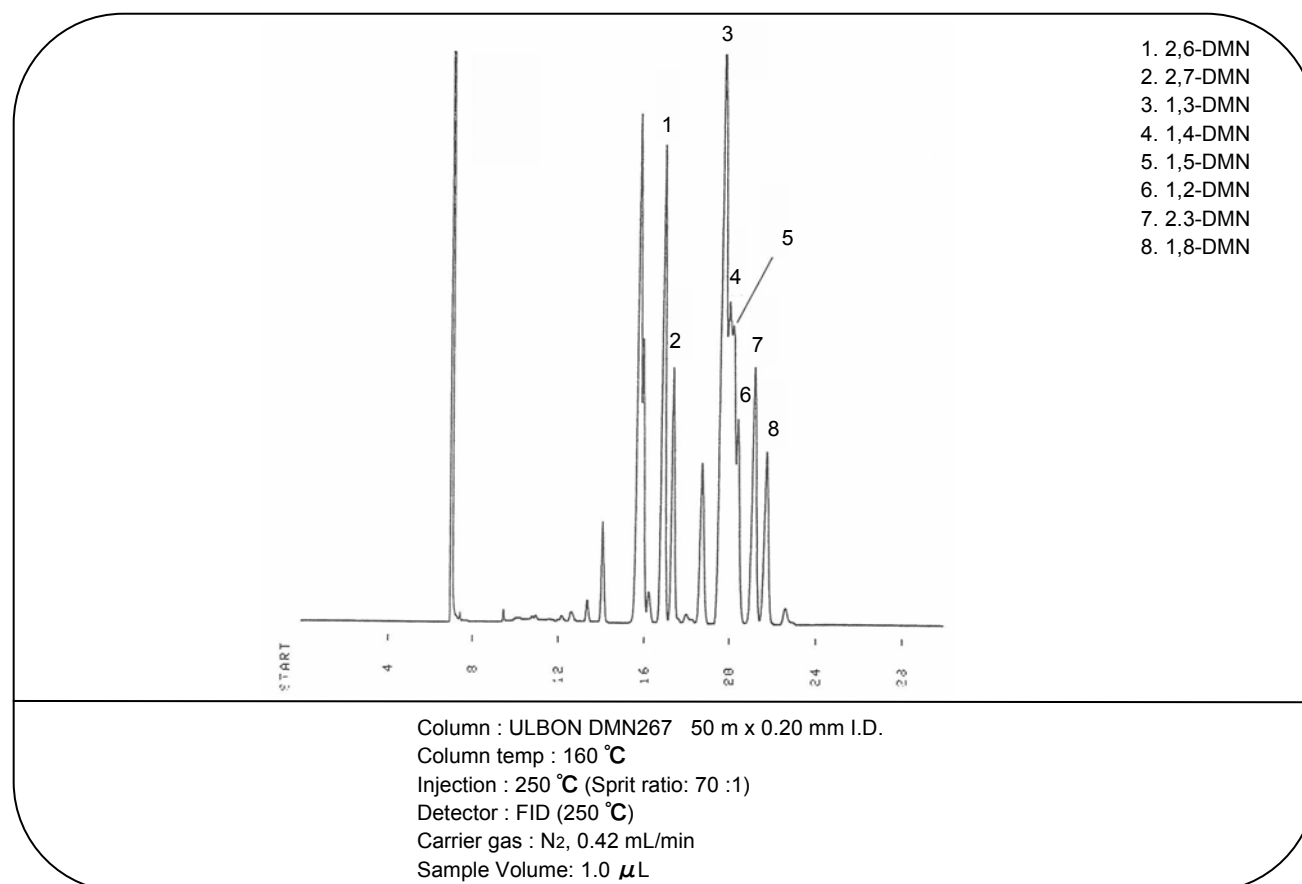
Styrene monomer (10ppm) in DMF



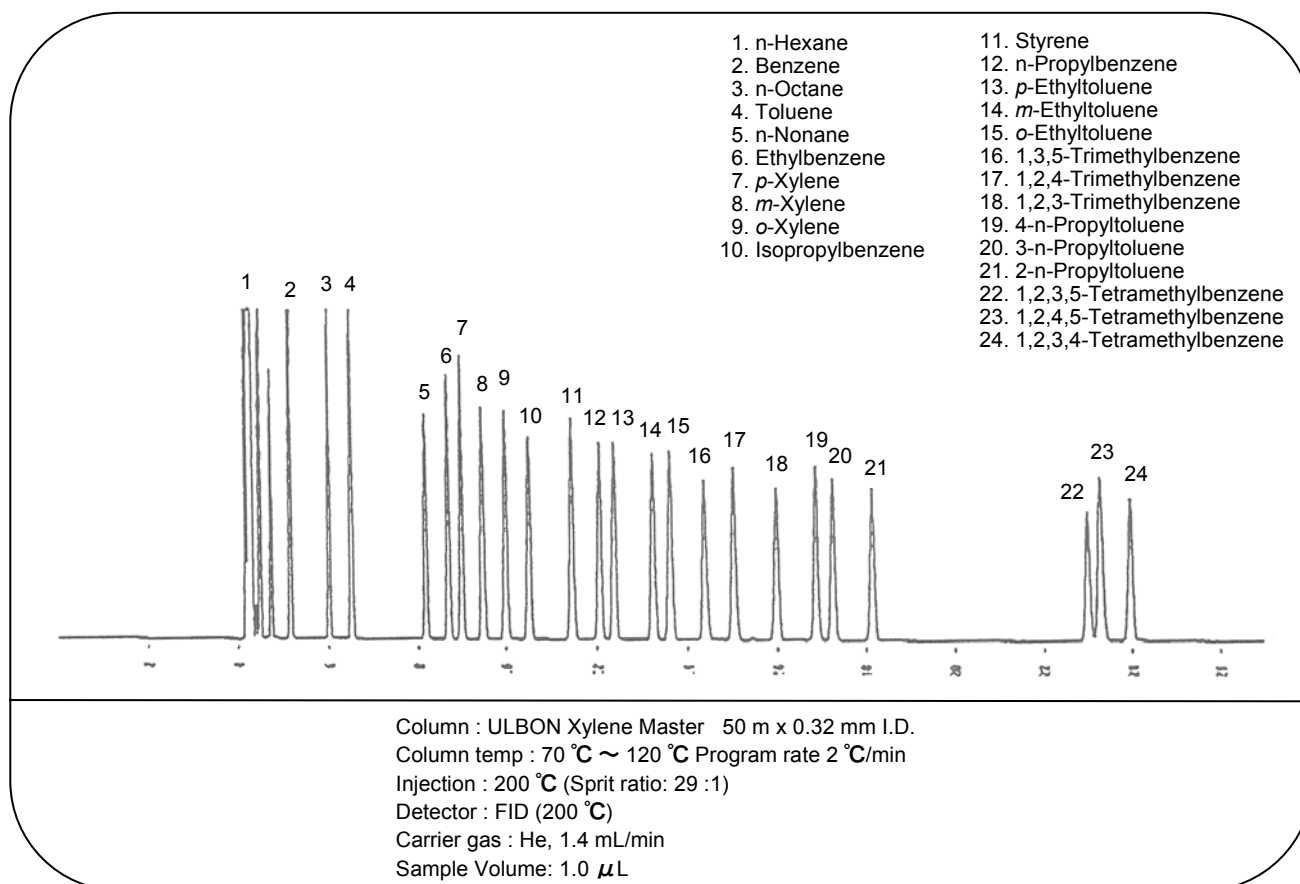
Dimethylnaphthalene (DMN) mixture



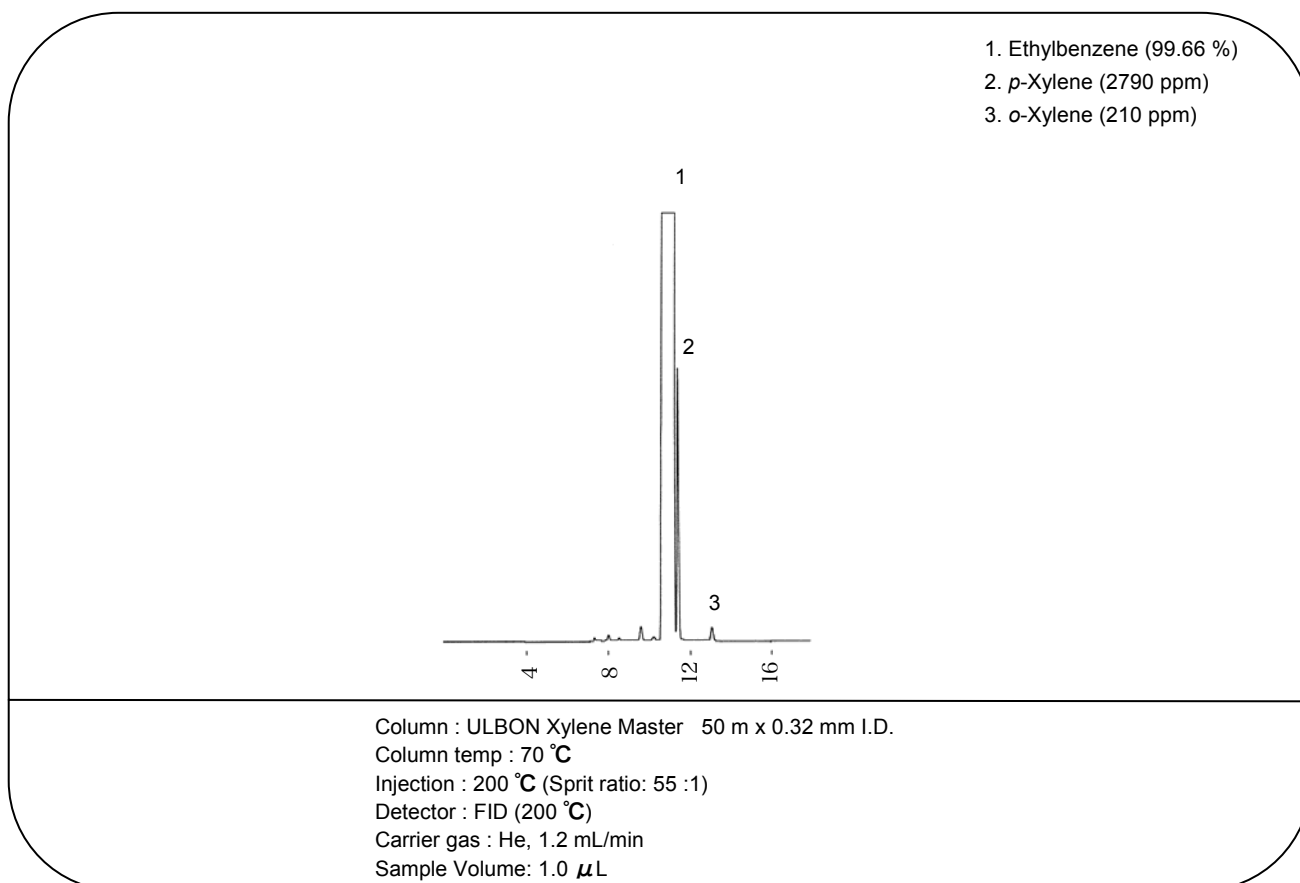
2,6-, 2,7-Dimethylnaphthalene



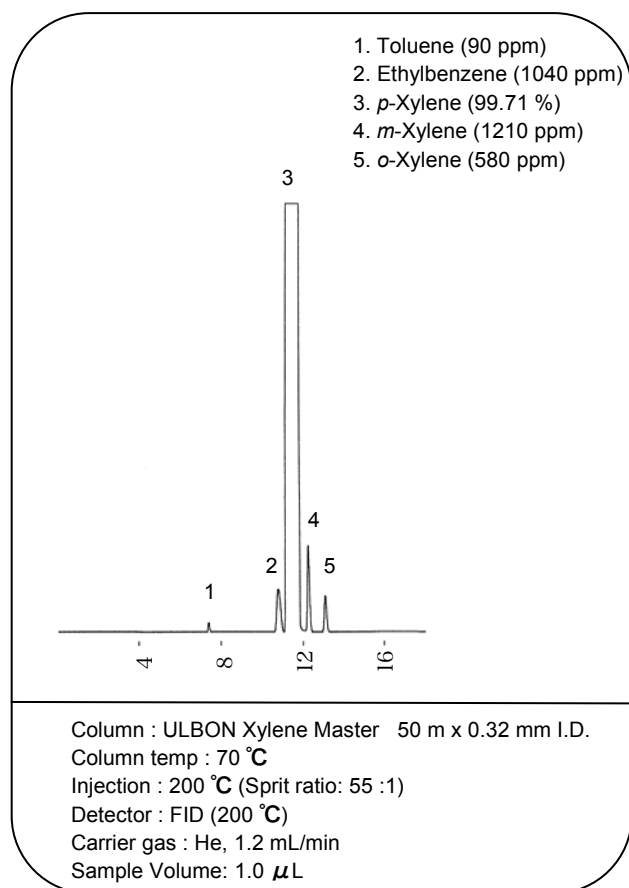
Alkyl benzene isomers



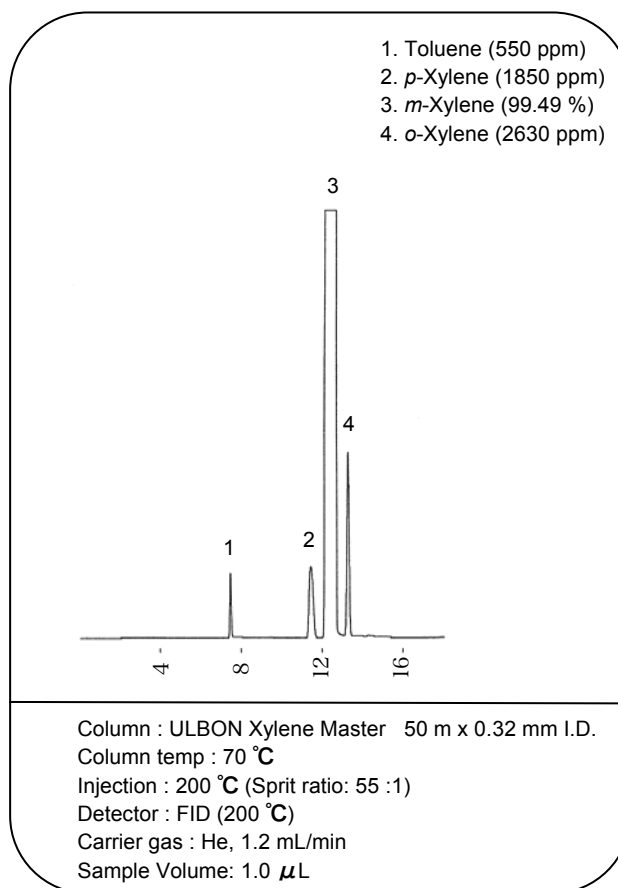
Ethylbenzene



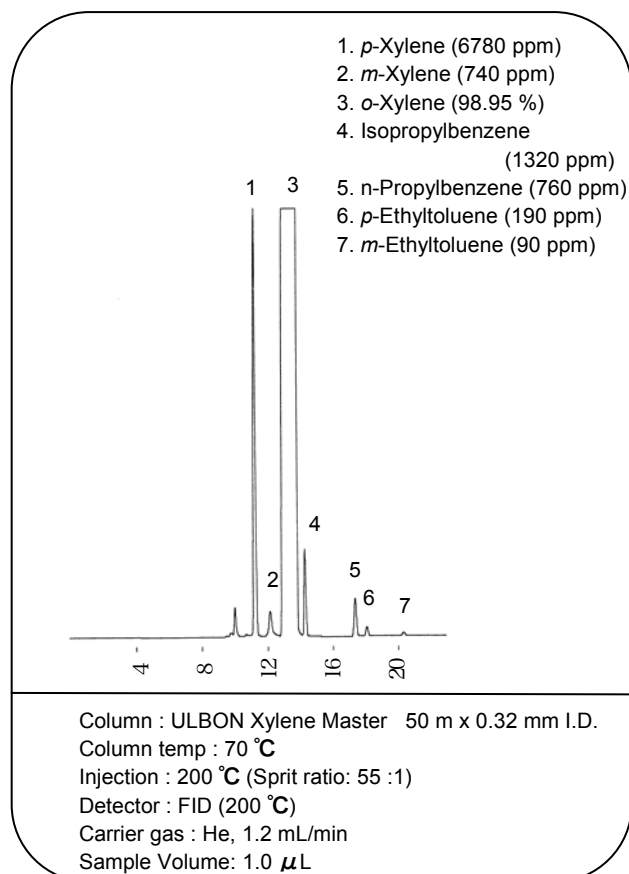
p-Xylene



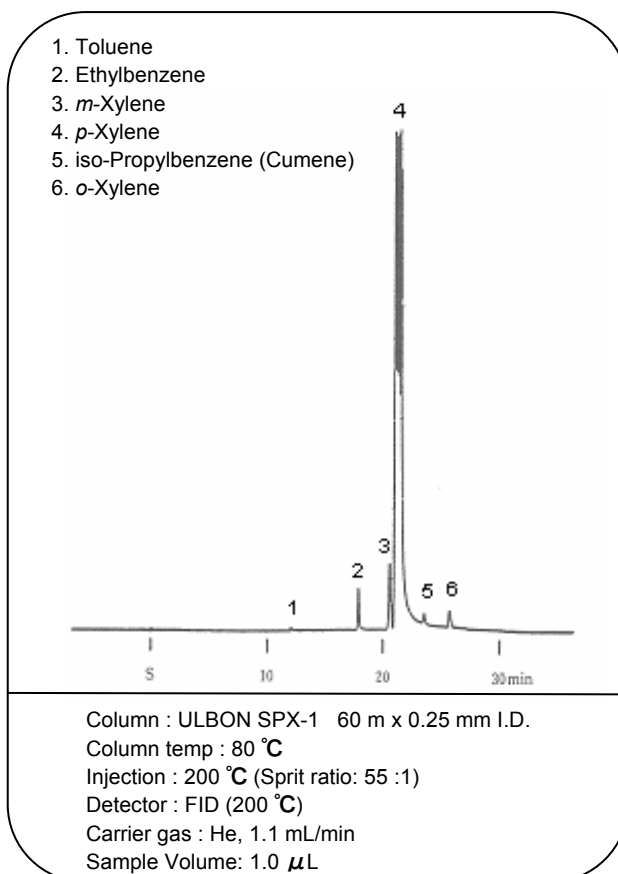
m-Xylene



o-Xylene

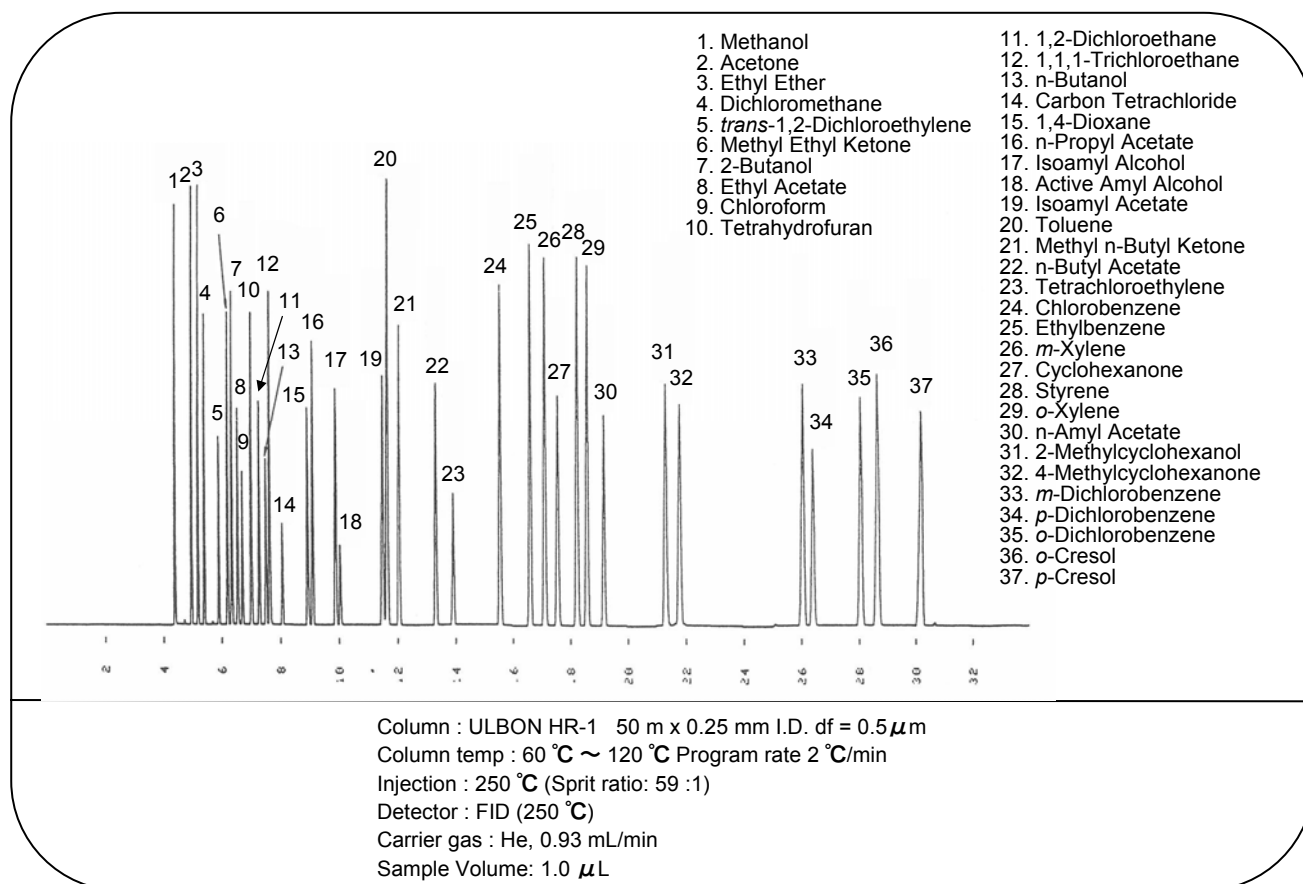


m-Xylene in *p*-Xylene

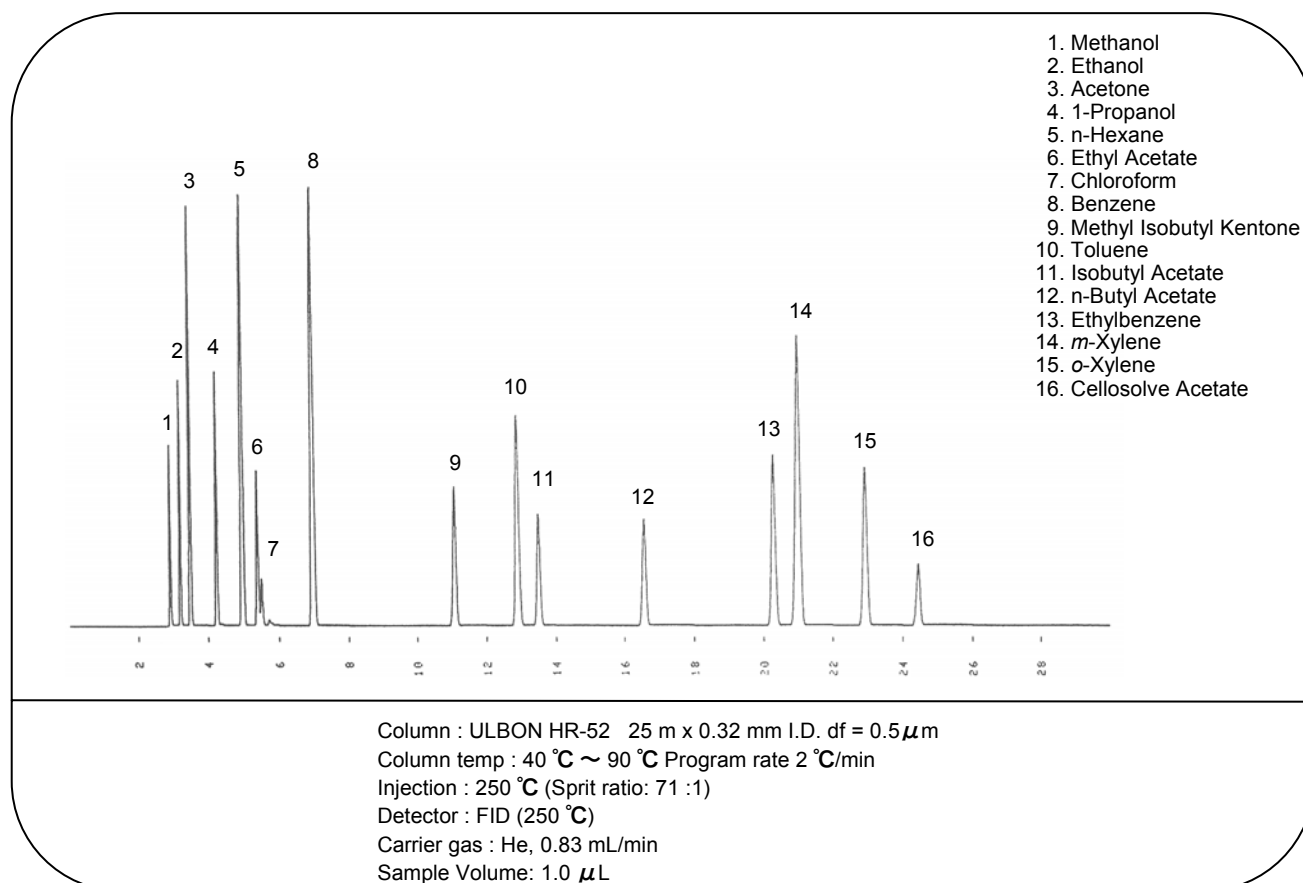


Organic Solvents

Solvents

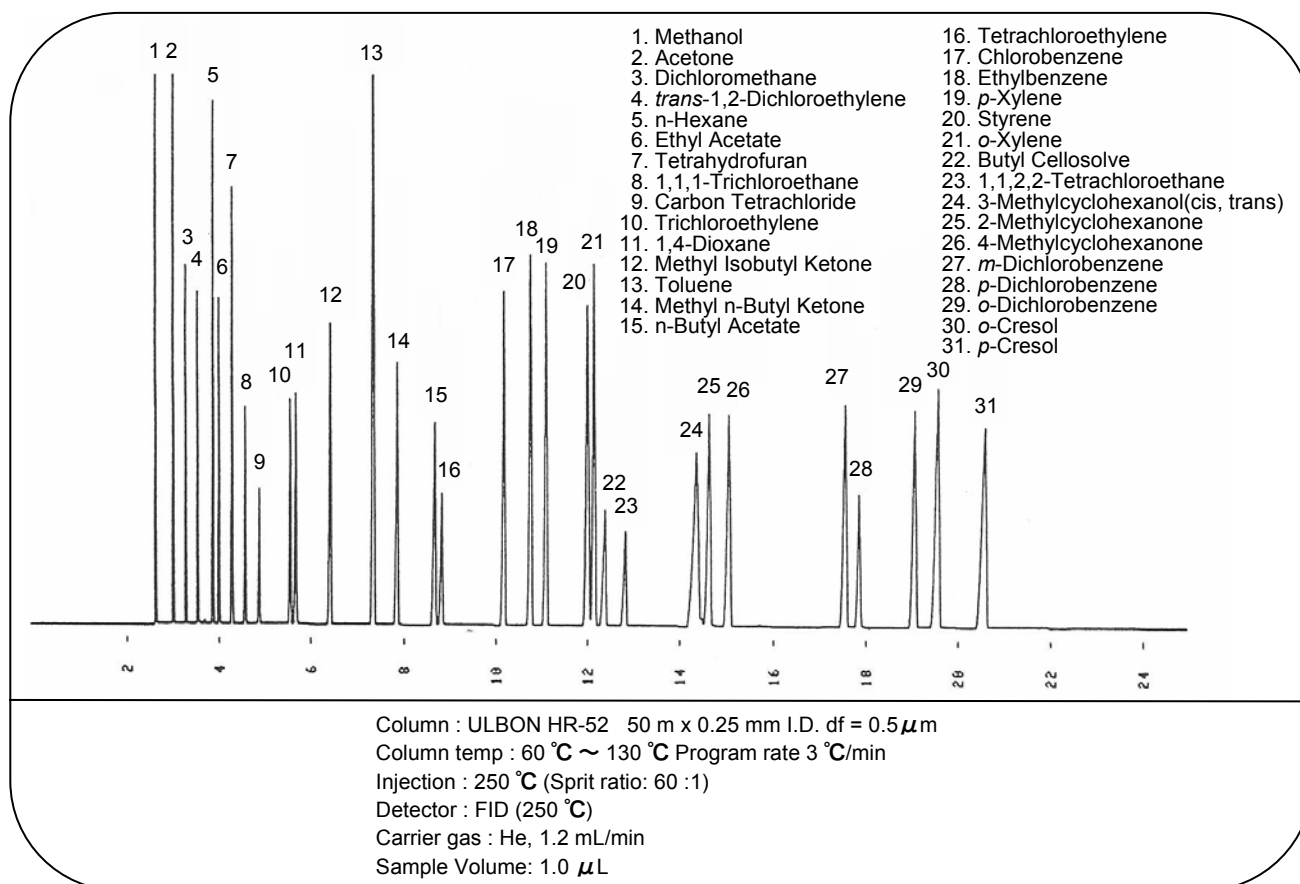


Solvents

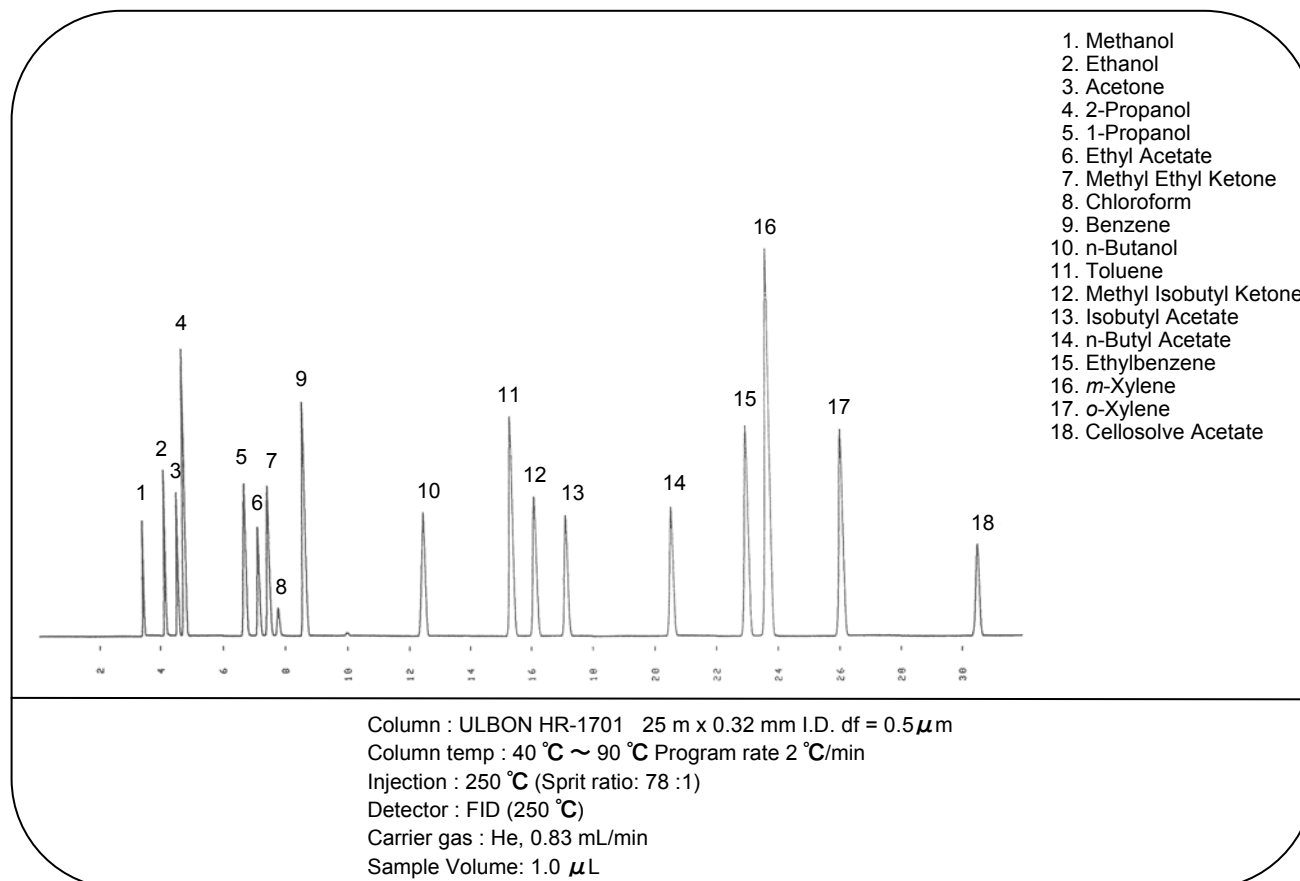


Organic Solvents

Solvents

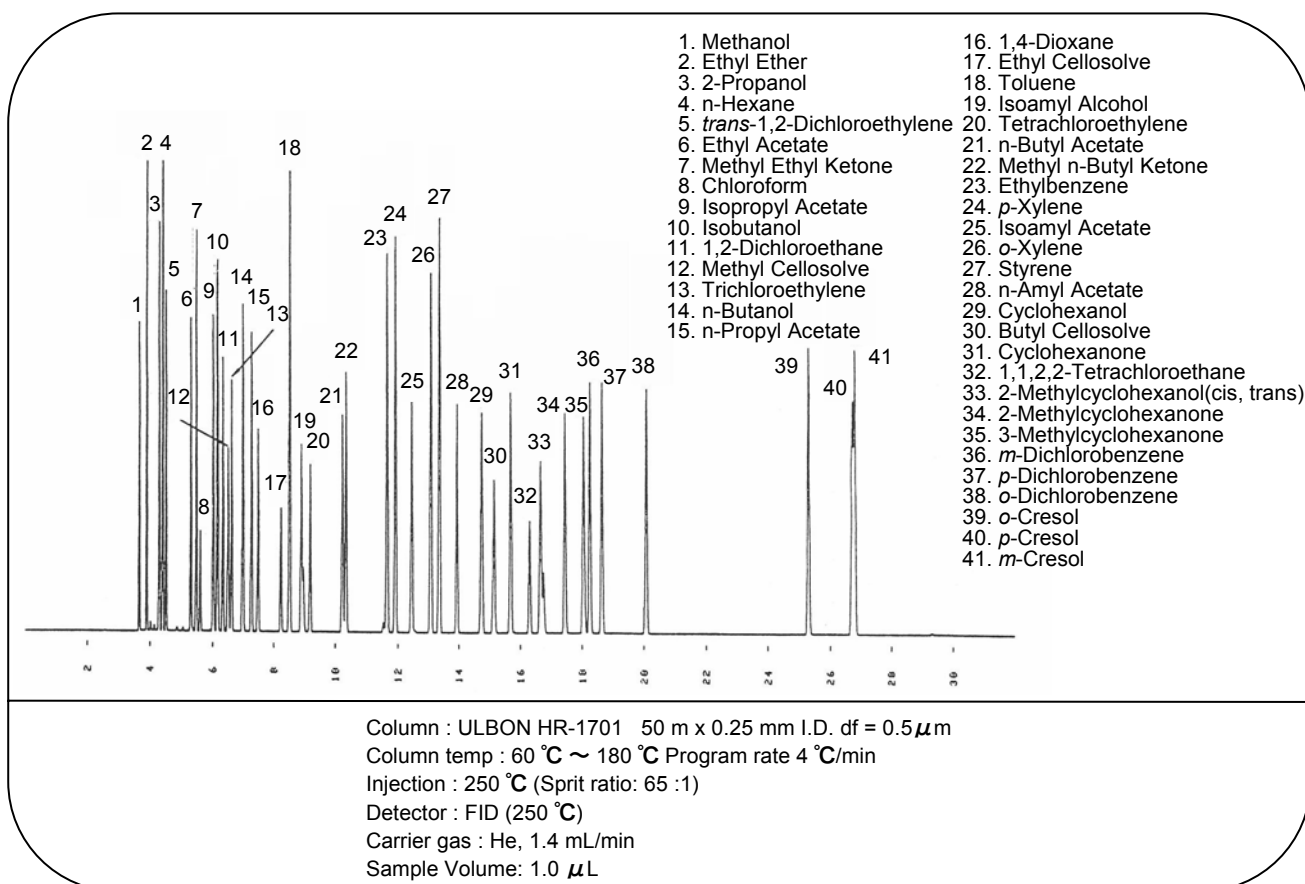


Solvents

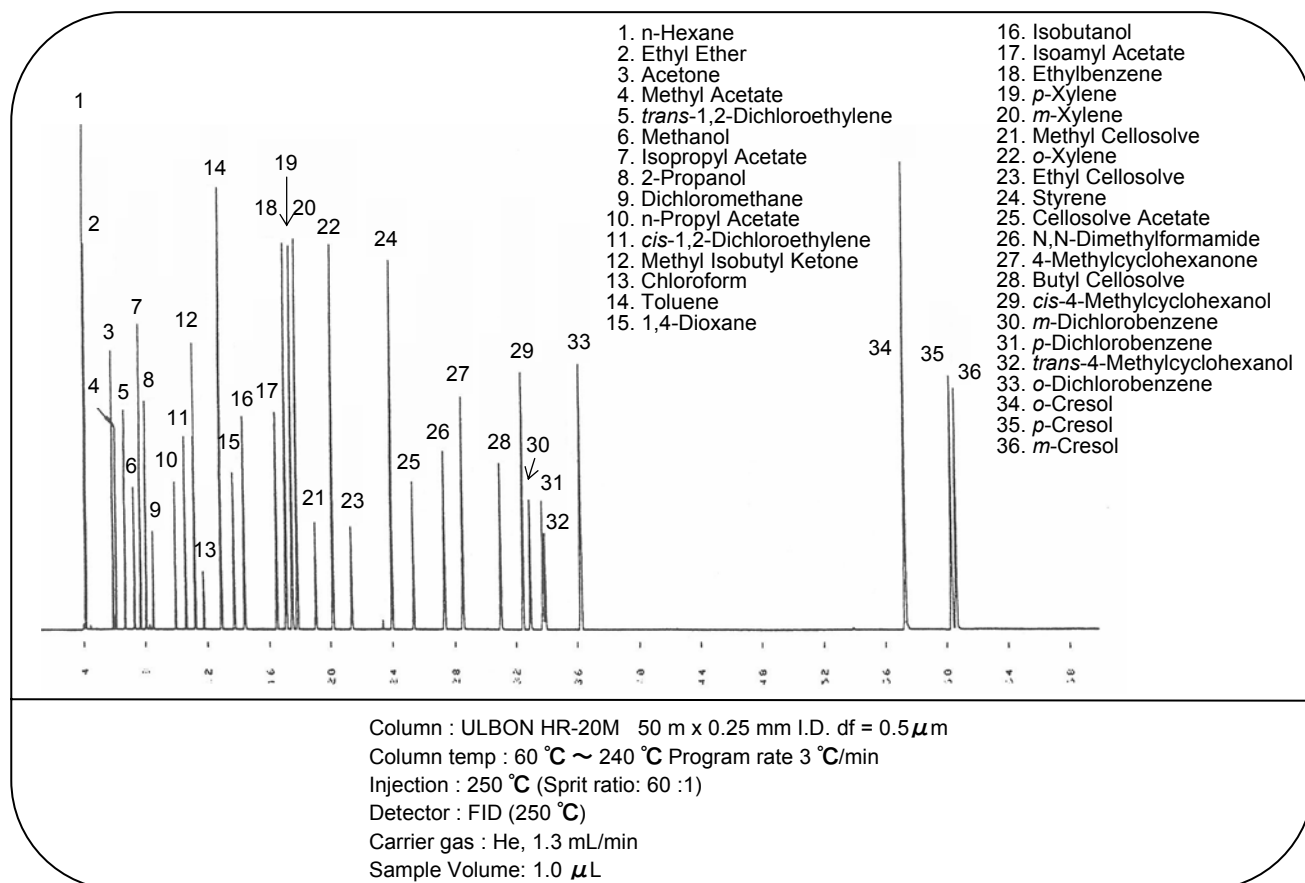


Organic Solvents

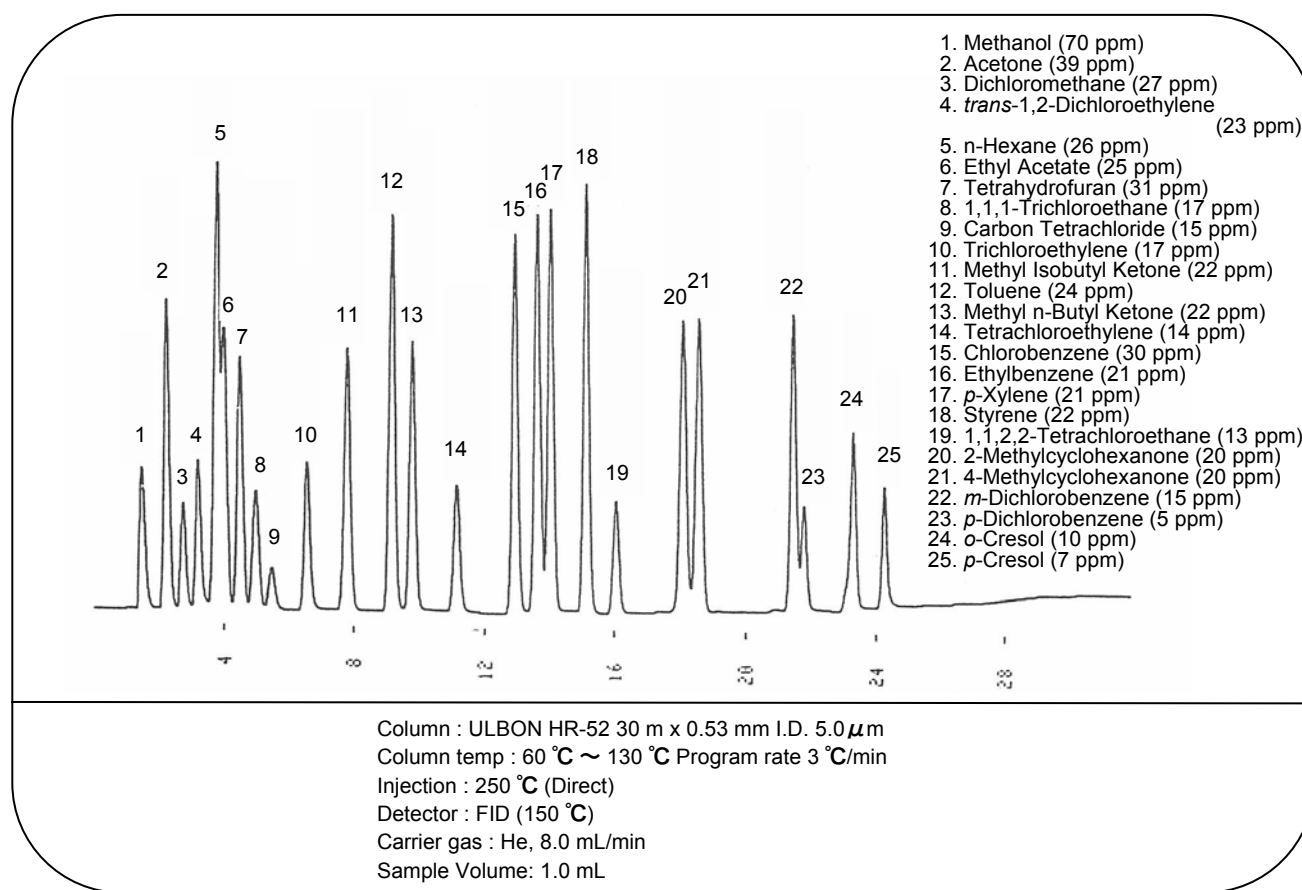
Solvents



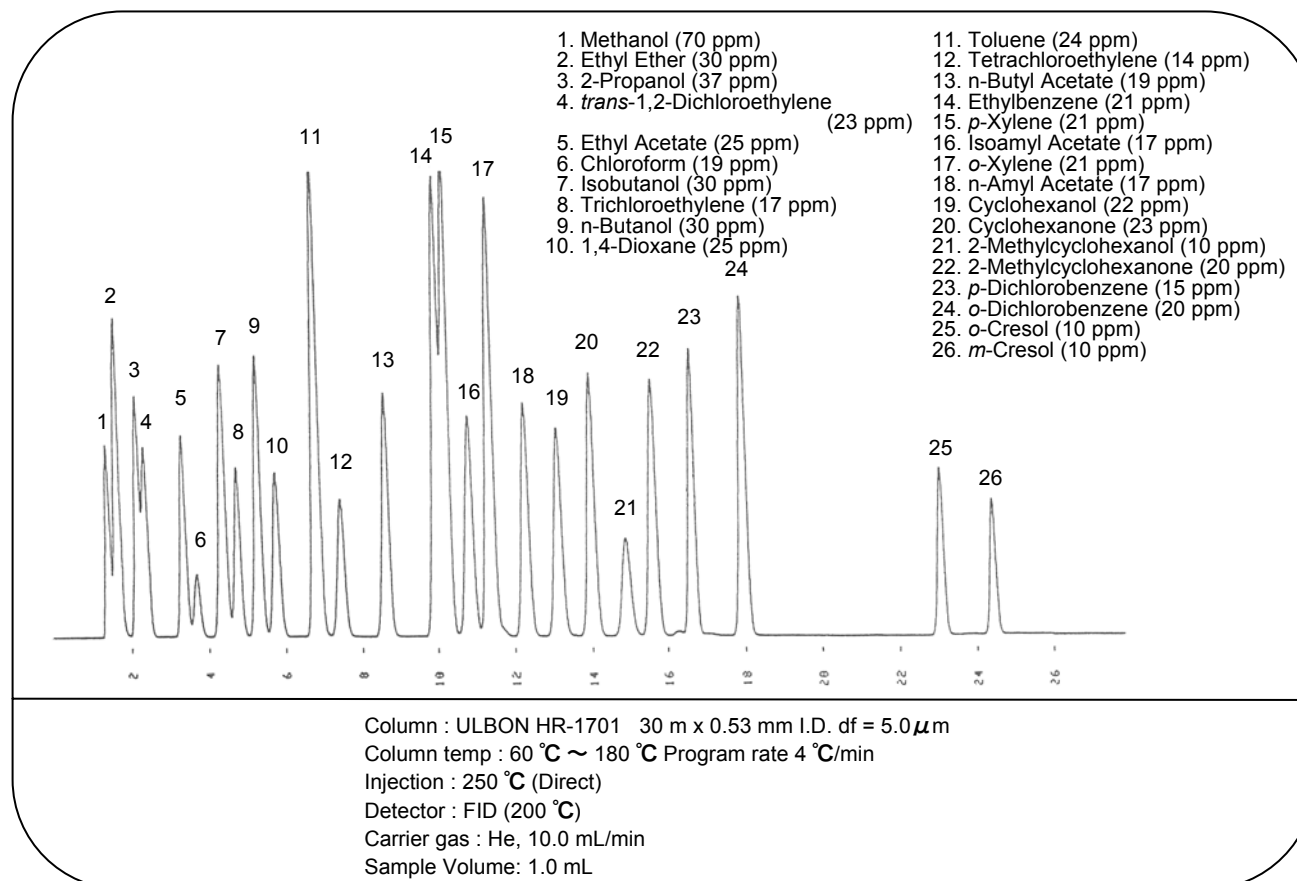
Solvents



The work environment

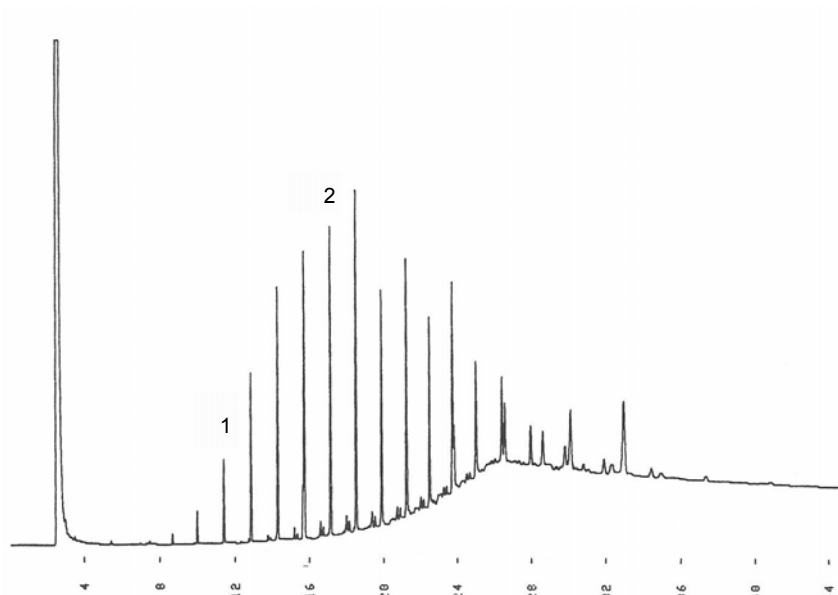


The work environment



Higher alcohols in Calnaubawax

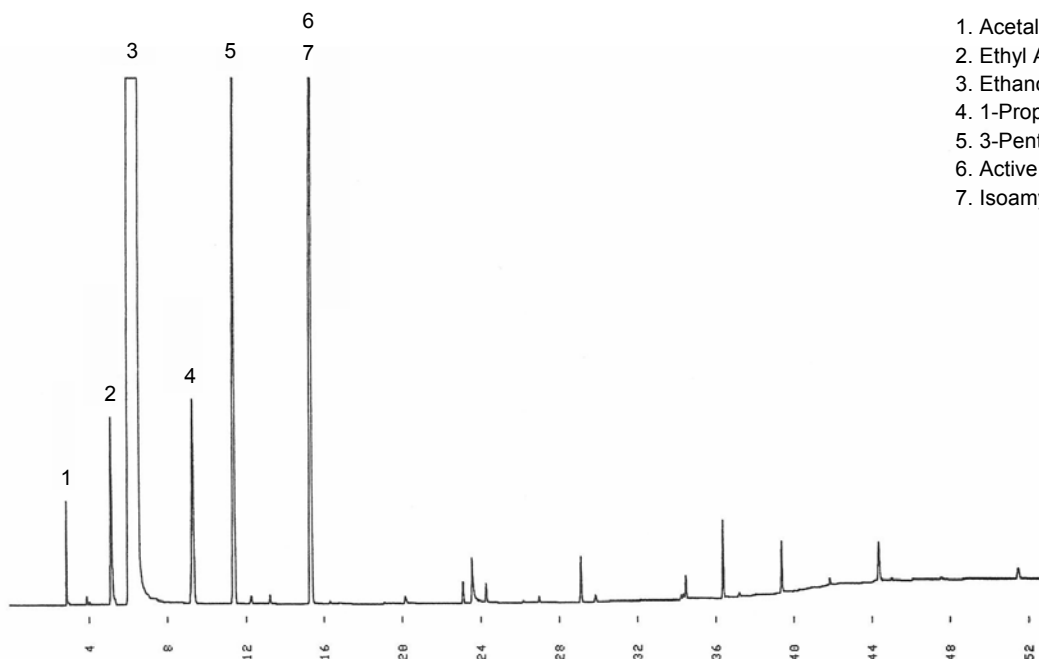
1. n-Octadecanol (C18)
2. n-Docosanol (C22)



Column : ULBON HR-52 25 m x 0.25 mm I.D. df = 0.25 μ m
 Column temp : 200 $^{\circ}$ C ~ 320 $^{\circ}$ C Program rate 5 $^{\circ}$ C/min
 Injection : 330 $^{\circ}$ C (Sprit ratio: 66 :1)
 Detector : FID (330 $^{\circ}$ C)
 Carrier gas : He, 0.5 mL/min
 Sample Volume: 1.2 μ L

Scotch whisky

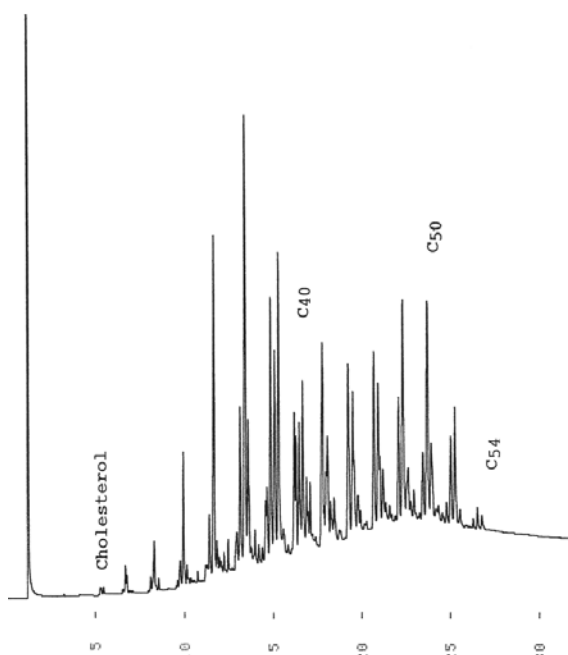
1. Acetaldehyde
2. Ethyl Acetate
3. Ethanol
4. 1-Propanol
5. 3-Pentanol
6. Active Amyl Alcohol
7. Isoamyl Alcohol



Column : ULBON HR-20M 50 m x 0.32 mm I.D. df = 1.0 μ m
 Column temp : 60 $^{\circ}$ C ~ 240 $^{\circ}$ C Program rate 5 $^{\circ}$ C/min
 Injection : 250 $^{\circ}$ C (Sprit ratio: 10 :1)
 Detector : FID (250 $^{\circ}$ C)
 Carrier gas : He, 4.0 mL/min
 Sample Volume: 0.6 μ L

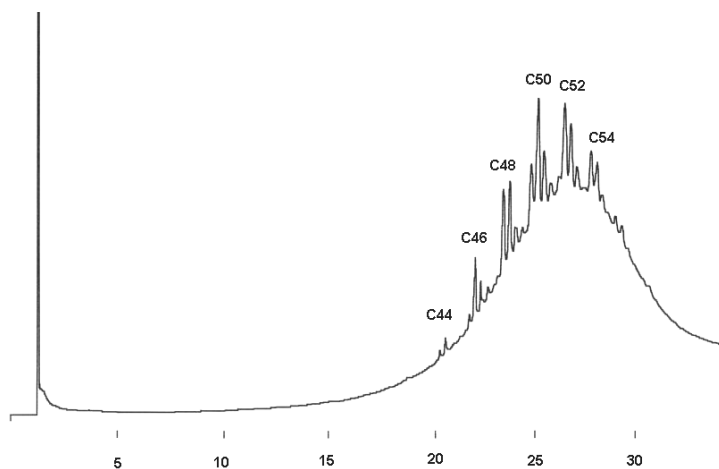
Triglyceride

Butter



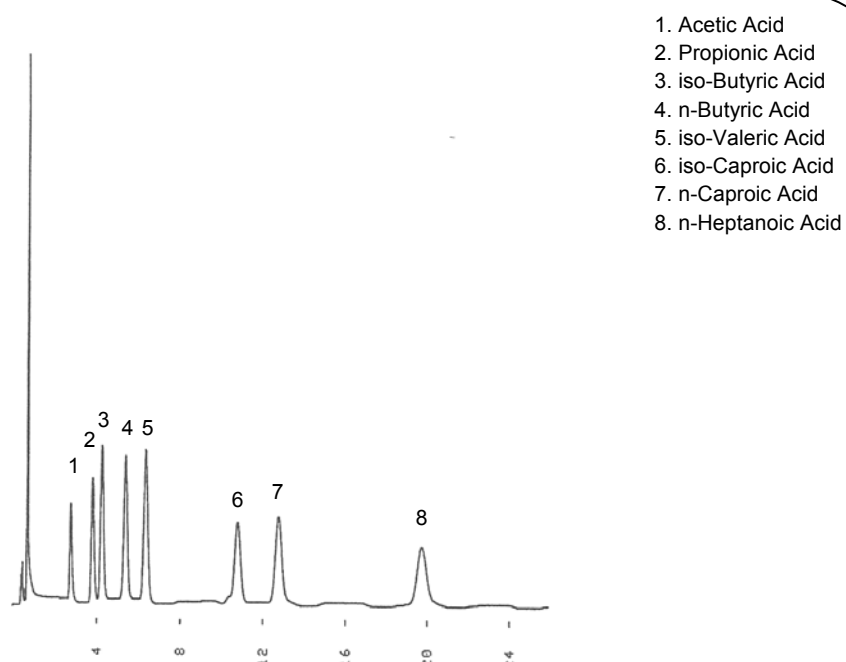
Column : ULBON HR-TGC-1 30 m x 0.25 mm I.D.
Column temp : 250 °C ~ 380 °C Program rate 5 °C/min
Injection : 380 °C (Split ratio: 45 :1)
Detector : FID (380 °C)
Carrier gas : He, 1.5 mL/min
Sample Volume: 1.0 μ L

Salmon oil



Column : ULBON HR-TGC-1 30 m x 0.25 mm I.D.
Column temp : 25 °C ~ 380 °C Program rate 5 °C/min
Injection : 380 °C (Split ratio: 45 :1)
Detector : FID (380 °C)
Carrier gas : He, 1.5 mL/min
Sample Volume: 1.0 μ L

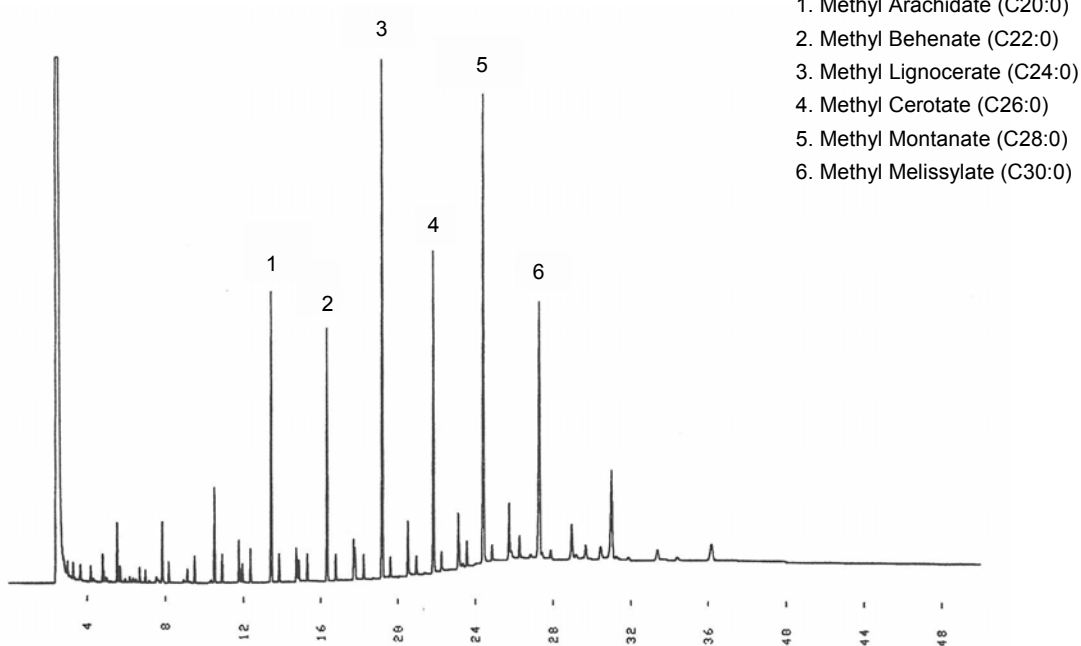
Lower fatty acids in water



1. Acetic Acid
2. Propionic Acid
3. iso-Butyric Acid
4. n-Butyric Acid
5. iso-Valeric Acid
6. iso-Caproic Acid
7. n-Caproic Acid
8. n-Heptanoic Acid

Column : ULBON HR-20M 30 m x 0.53 mm I.D. df = 3.0 μ m
 Column temp : 150 °C
 Injection : 250 °C (Direct)
 Detector : FID (250 °C)
 Carrier gas : He, 10.5 mL/min
 Sample Volume: 0.4 μ L

Higher fatty acid esters in Calnaubawax

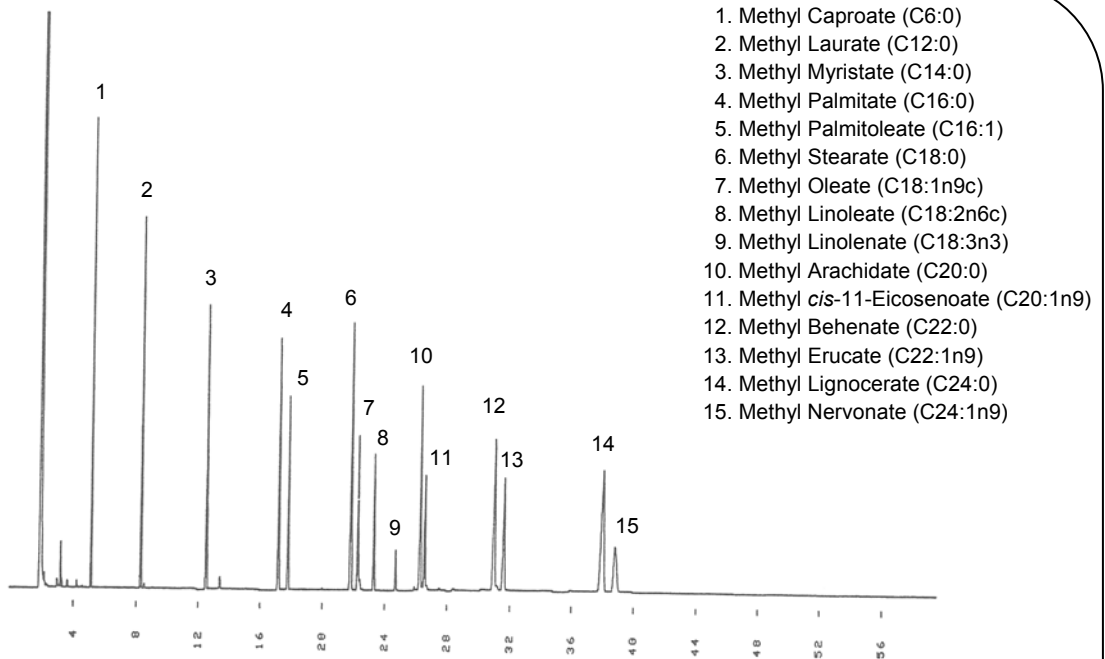


1. Methyl Arachidate (C20:0)
2. Methyl Behenate (C22:0)
3. Methyl Lignocerate (C24:0)
4. Methyl Cerotate (C26:0)
5. Methyl Montanate (C28:0)
6. Methyl Melissylate (C30:0)

Column : ULBON HR-52 25 m x 0.25 mm I.D. 0.25 μ m
 Column temp : 200 °C ~ 320 °C Program rate 5 °C/min
 Injection : 330 °C (Split ratio: 61 : 1)
 Detector : FID (330 °C)
 Carrier gas : He, 0.5 mL/min
 Sample Volume: 1.0 μ L

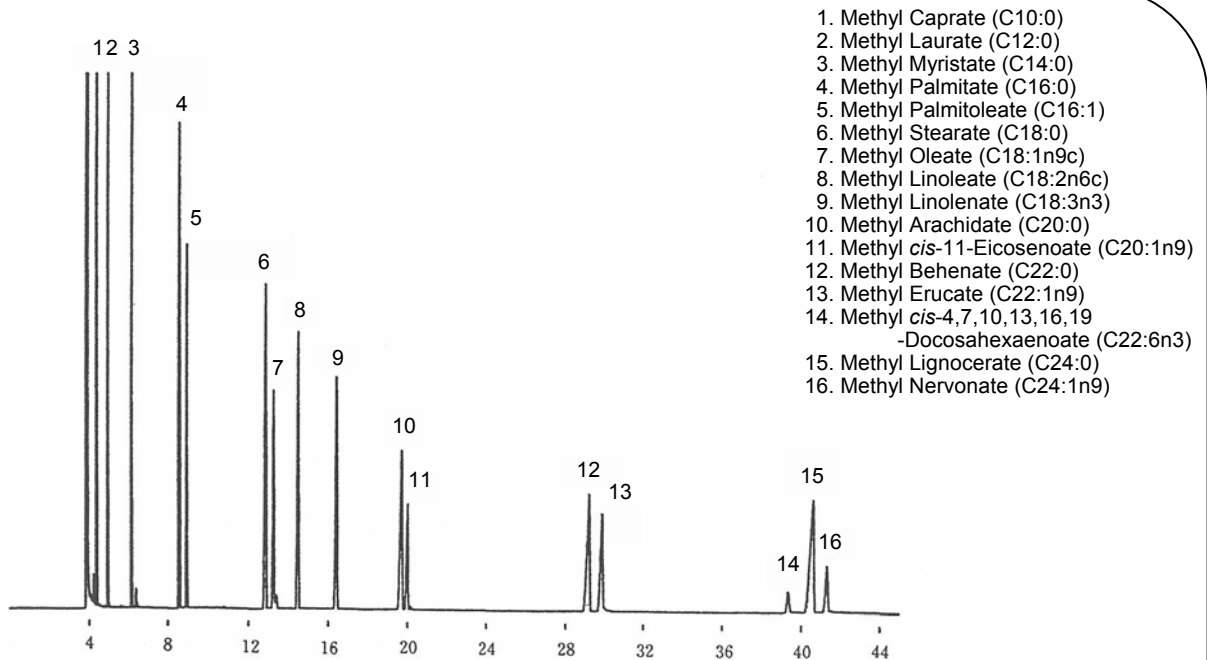
Fatty Acids and Esters

Fatty acid methyl esters



Column : ULBON HR-20M 25 m x 0.25 mm I.D. df = 0.25 μ m
 Column temp : 130 $^{\circ}$ C ~ 240 $^{\circ}$ C Program rate 4 $^{\circ}$ C/min
 Injection : 250 $^{\circ}$ C (Sprit ratio: 40 :1)
 Detector : FID (250 $^{\circ}$ C)
 Carrier gas : He, 1.1 mL/min
 Sample Volume: 1.0 μ L

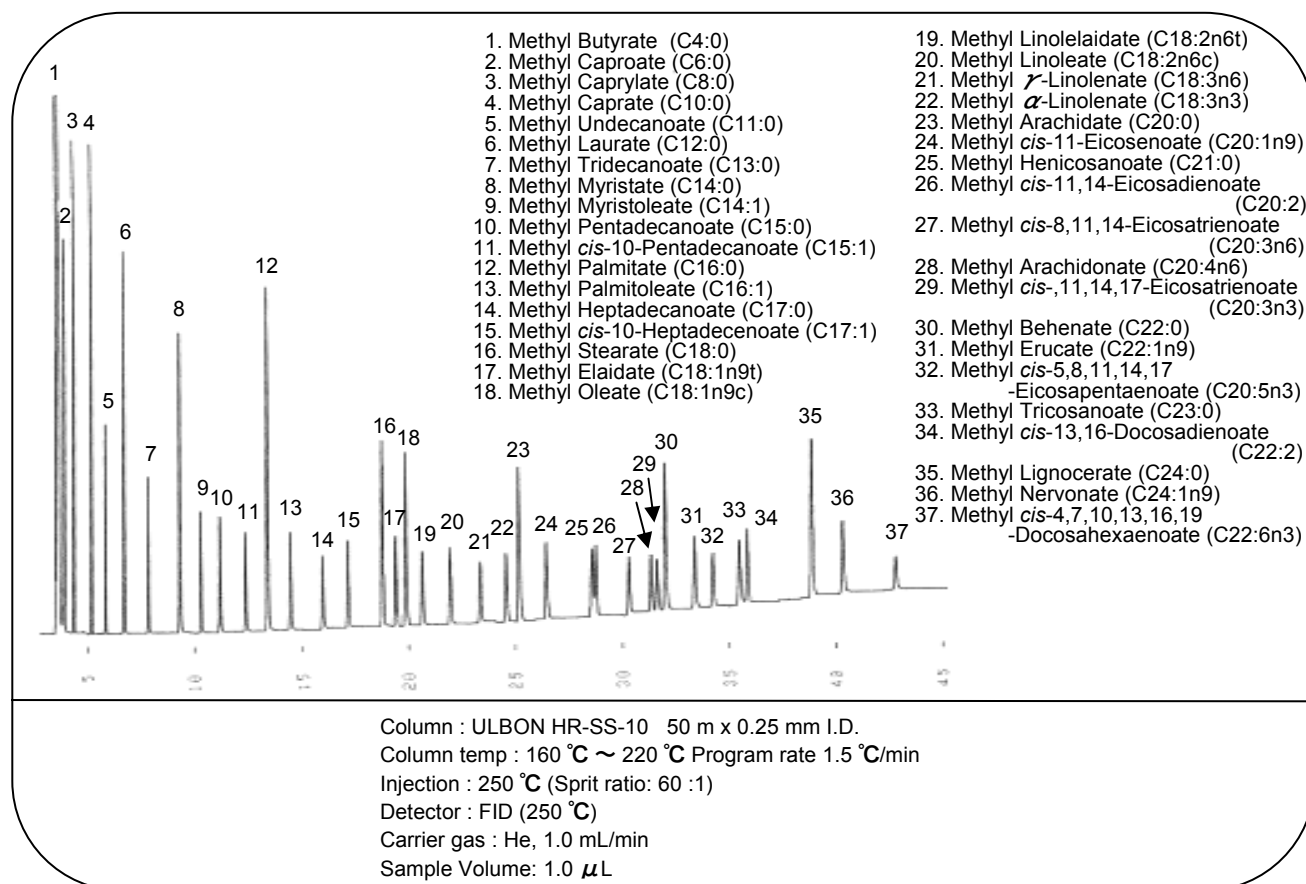
Fatty acid methyl esters standard



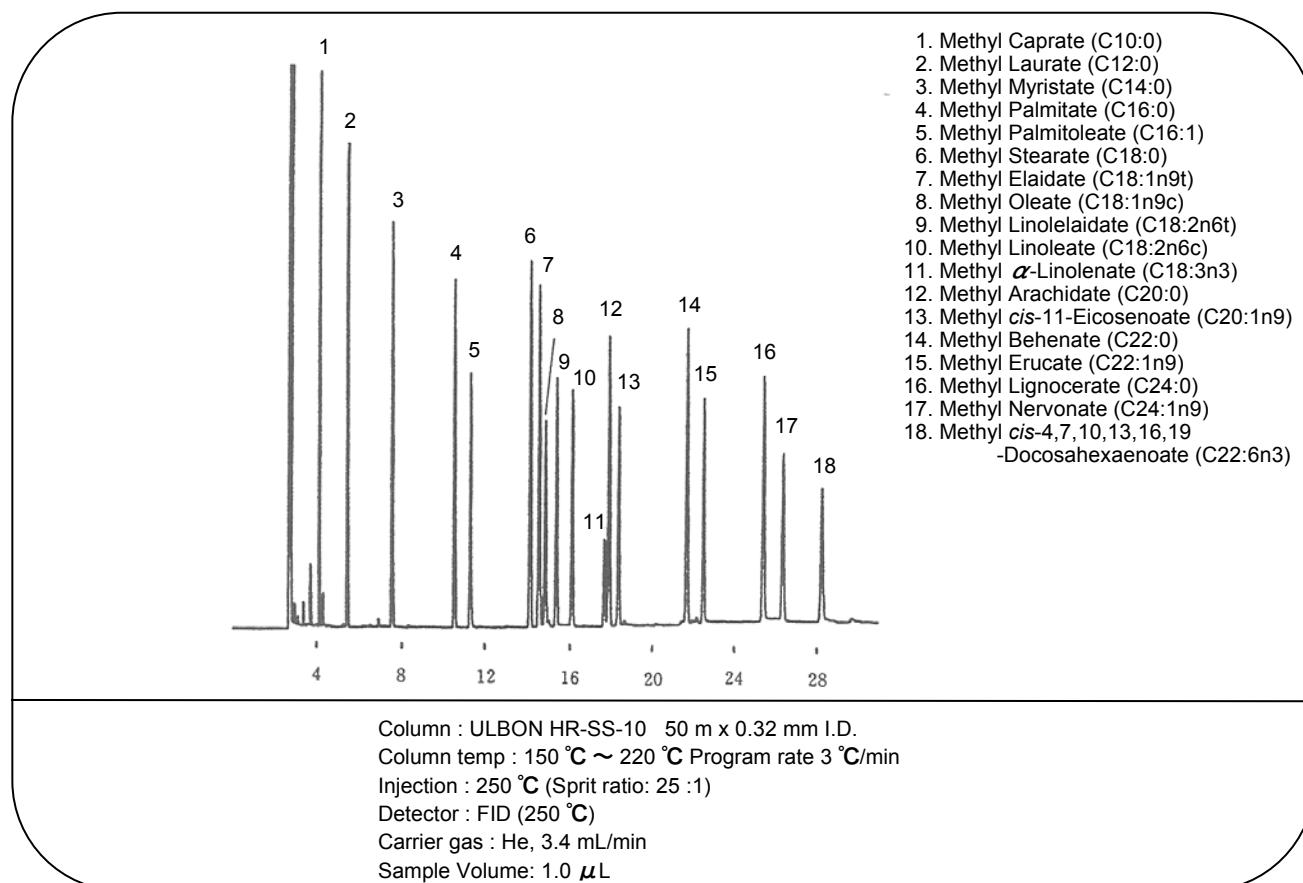
Column : ULBON HR-Thermon-3000B 50 m x 0.25 mm I.D.
 Column temp : 180 $^{\circ}$ C ~ 220 $^{\circ}$ C Program rate 1 $^{\circ}$ C/min
 Injection : 250 $^{\circ}$ C (Sprit ratio: 50 :1)
 Detector : FID (250 $^{\circ}$ C)
 Carrier gas : He, 1.7 mL/min
 Sample Volume: 1.0 μ L

Fatty Acids and Esters

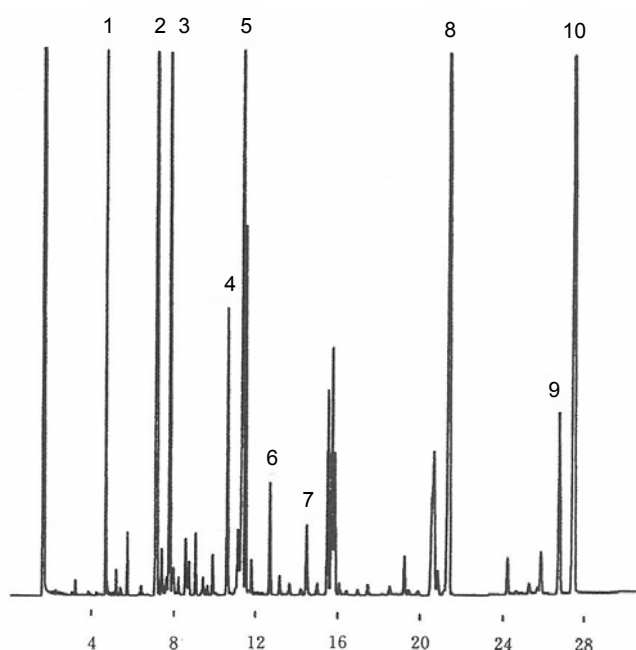
Fatty acid methyl esters standard



Fatty acid methyl esters standard



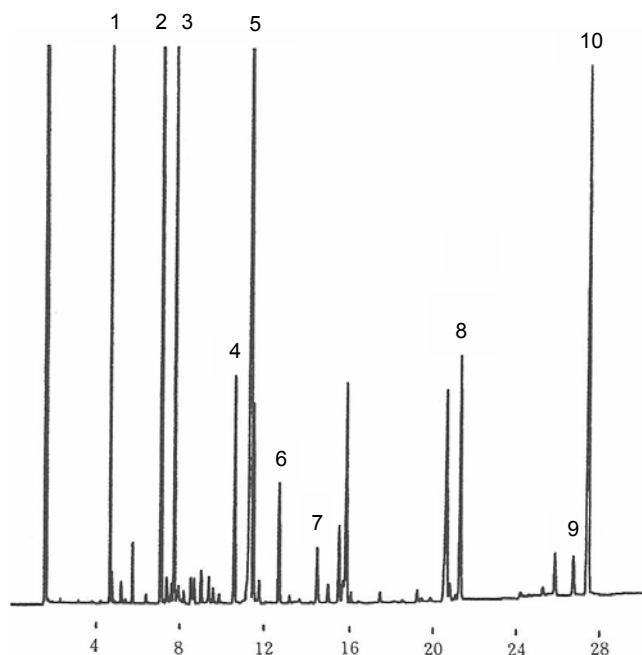
Young yellowtail oil



1. Methyl Myristate (C14:0)
2. Methyl Palmitate (C16:0)
3. Methyl Palmitoleate (C16:1)
4. Methyl Stearate (C18:0)
5. Methyl Oleate (C18:1n9c)
6. Methyl Linoleate (C18:2n6c)
7. Methyl α -Linolenate (C18:3n3)
8. Methyl *cis*-5,8,11,14,17
-Eicosapentaenoate (C20:5n3)
9. Methyl *cis*-7,10,13,16,19
-Docosapentaenoate (C22:5n3)
10. Methyl *cis*-4,7,10,13,16,19
-Docosahexaenoate (C22:6n3)

Column : ULBON HR-SS-10 25 m x 0.25 mm I.D.
 Column temp : 150 °C ~ 220 °C Program rate 2 °C/min
 Injection : 250 °C (Split ratio: 60 :1)
 Detector : FID (250 °C)
 Carrier gas : He, 1.5 mL/min
 Sample Volume: 1.0 μ L

Tuna oil

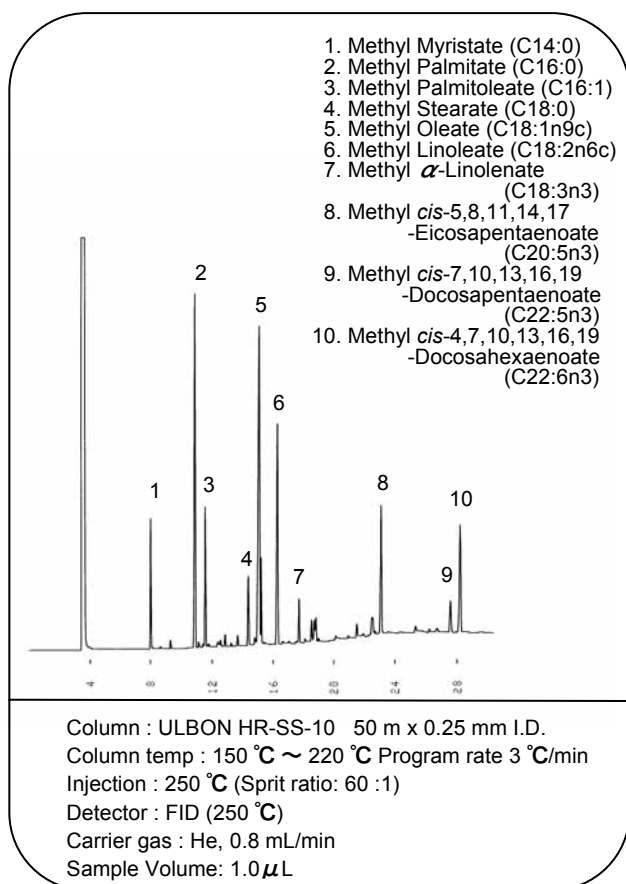


1. Methyl Myristate (C14:0)
2. Methyl Palmitate (C16:0)
3. Methyl Palmitoleate (C16:1)
4. Methyl Stearate (C18:0)
5. Methyl Oleate (C18:1n9c)
6. Methyl Linoleate (C18:2n6c)
7. Methyl α -Linolenate (C18:3n3)
8. Methyl *cis*-5,8,11,14,17
-Eicosapentaenoate (C20:5n3)
9. Methyl *cis*-7,10,13,16,19
-Docosapentaenoate (C22:5n3)
10. Methyl *cis*-4,7,10,13,16,19
-Docosahexaenoate (C22:6n3)

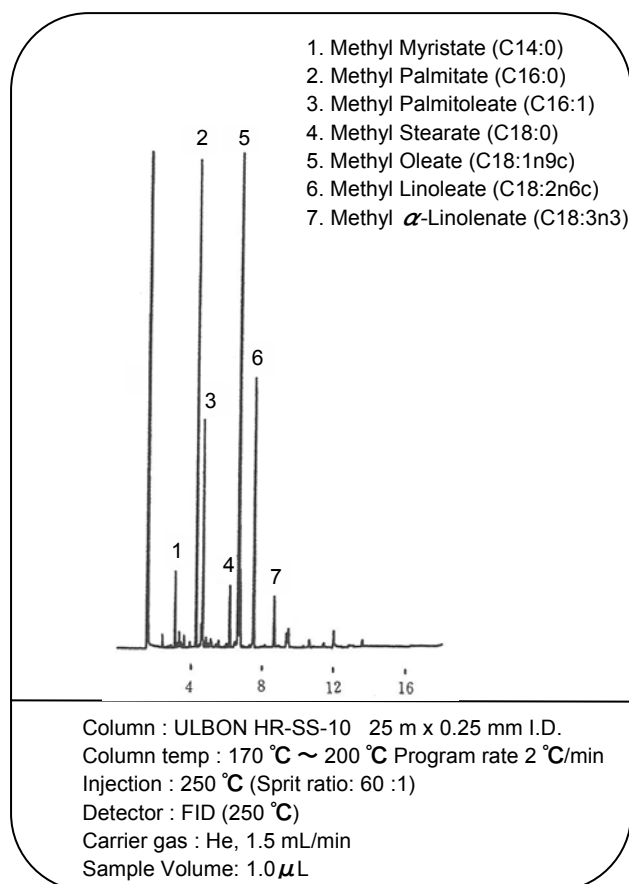
Column : ULBON HR-SS-10 25 m x 0.25 mm I.D.
 Column temp : 150 °C ~ 220 °C Program rate 2 °C/min
 Injection : 250 °C (Split ratio: 60 :1)
 Detector : FID (250 °C)
 Carrier gas : He, 1.5 mL/min
 Sample Volume: 1.0 μ L

Fatty Acids and Esters

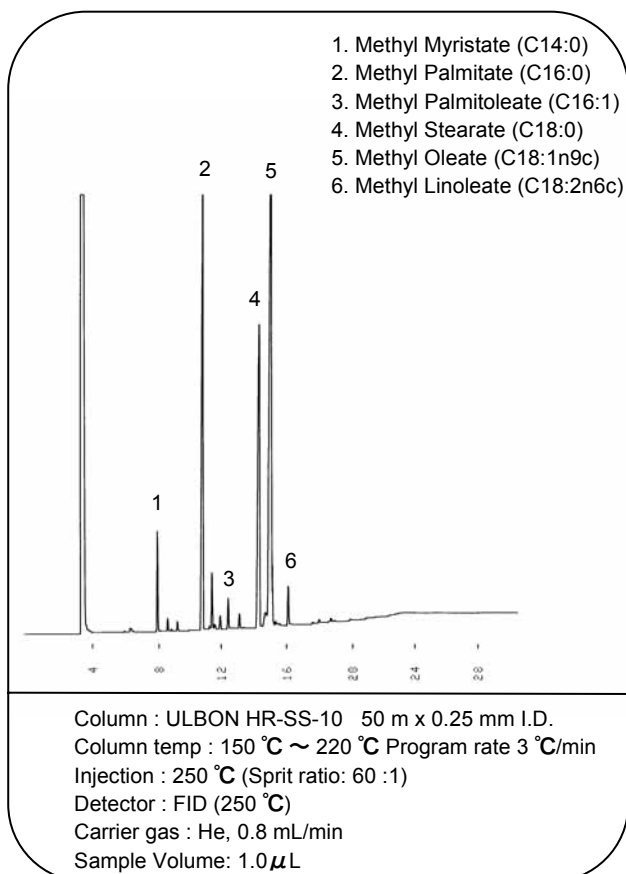
Yellowtail oil



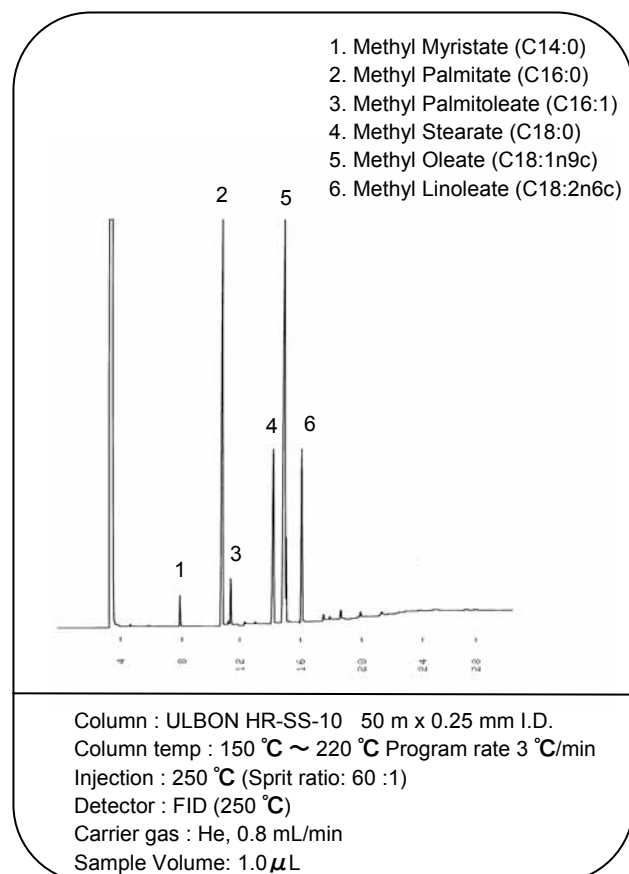
Carp oil



Beef tallow

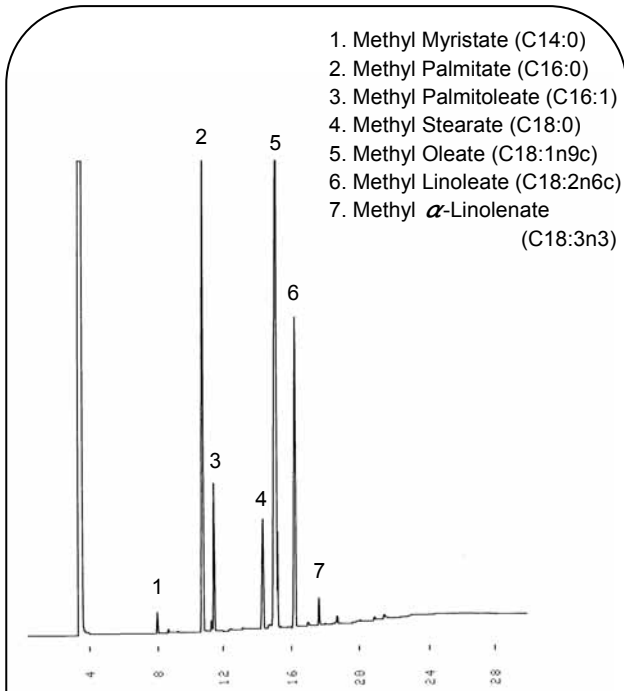


Lard



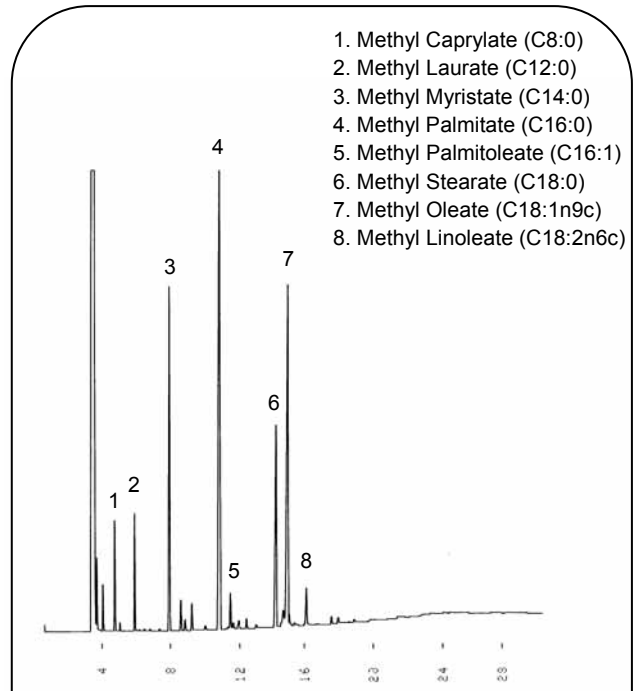
Fatty Acids and Esters

Chicken oil



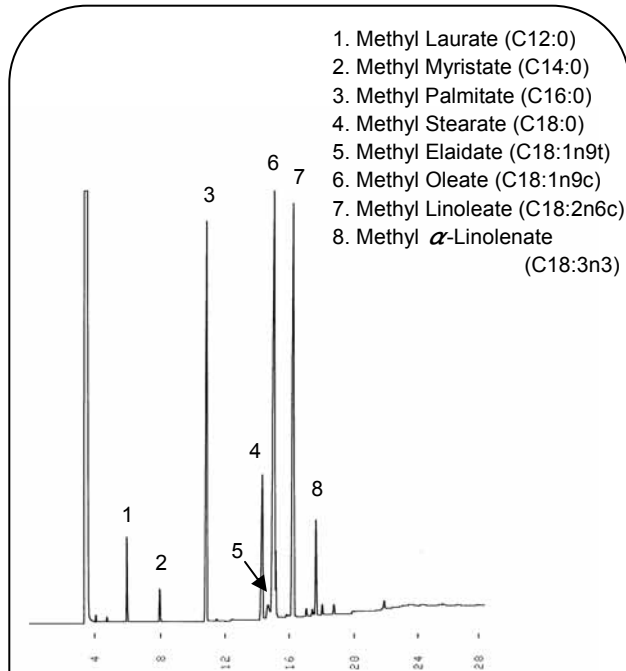
Column : ULBON HR-SS-10 50 m x 0.25 mm I.D.
 Column temp : 150 °C ~ 220 °C Program rate 3 °C/min
 Injection : 250 °C (Sprit ratio: 60 :1)
 Detector : FID (250 °C)
 Carrier gas : He, 0.8 mL/min
 Sample Volume: 1.0 μ L

Butter



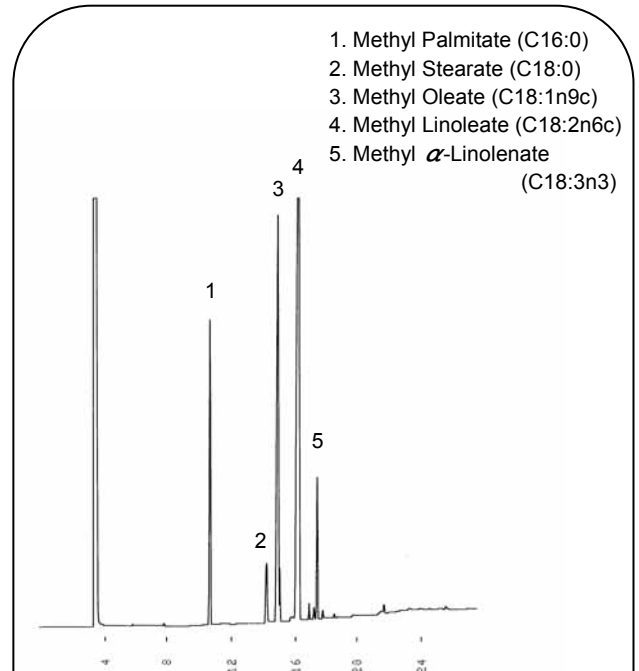
Column : ULBON HR-SS-10 50 m x 0.25 mm I.D.
 Column temp : 150 °C ~ 220 °C Program rate 3 °C/min
 Injection : 250 °C (Sprit ratio: 60 :1)
 Detector : FID (250 °C)
 Carrier gas : He, 0.8 mL/min
 Sample Volume: 1.0 μ L

Margarine



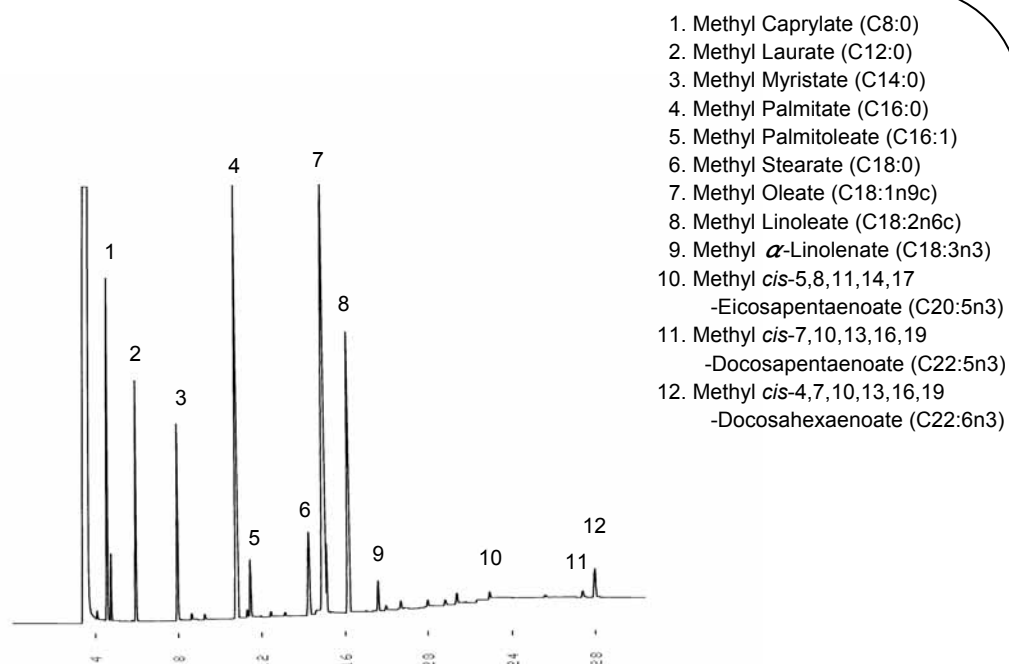
Column : ULBON HR-SS-10 50 m x 0.25 mm I.D.
 Column temp : 150 °C ~ 220 °C Program rate 3 °C/min
 Injection : 250 °C (Sprit ratio: 60 :1)
 Detector : FID (250 °C)
 Carrier gas : He, 0.8 mL/min
 Sample Volume: 1.0 μ L

Soybean



Column : ULBON HR-SS-10 50 m x 0.25 mm I.D.
 Column temp : 150 °C ~ 220 °C Program rate 3 °C/min
 Injection : 250 °C (Sprit ratio: 60 :1)
 Detector : FID (250 °C)
 Carrier gas : He, 0.8 mL/min
 Sample Volume: 1.0 μ L

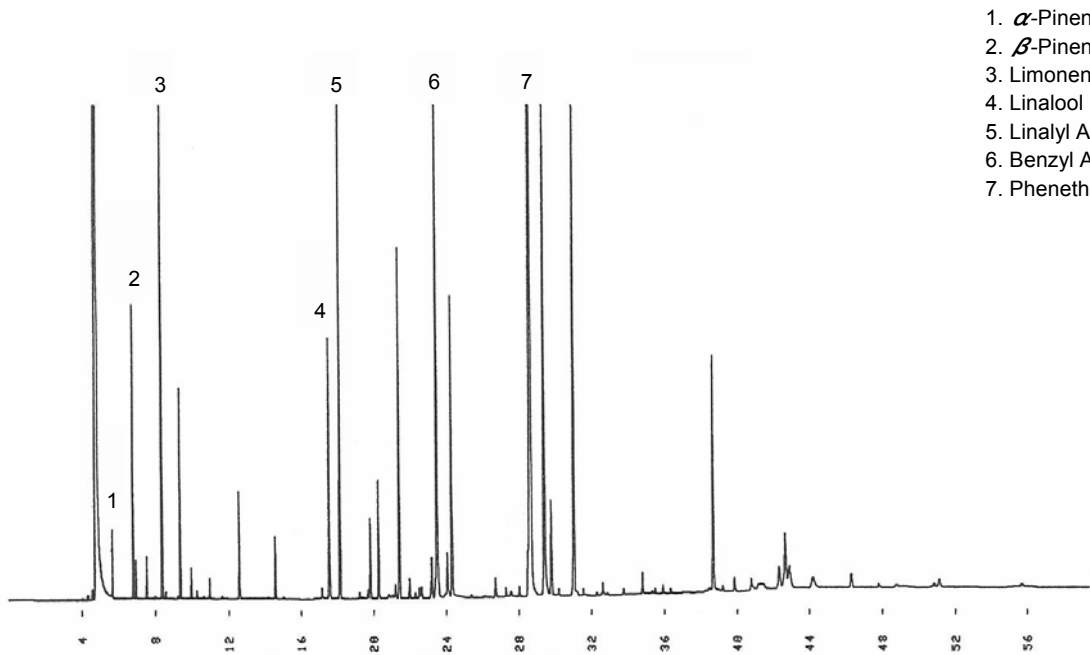
Breast milk



1. Methyl Caprylate (C8:0)
2. Methyl Laurate (C12:0)
3. Methyl Myristate (C14:0)
4. Methyl Palmitate (C16:0)
5. Methyl Palmitoleate (C16:1)
6. Methyl Stearate (C18:0)
7. Methyl Oleate (C18:1n9c)
8. Methyl Linoleate (C18:2n6c)
9. Methyl α -Linolenate (C18:3n3)
10. Methyl *cis*-5,8,11,14,17
-Eicosapentaenoate (C20:5n3)
11. Methyl *cis*-7,10,13,16,19
-Docosapentaenoate (C22:5n3)
12. Methyl *cis*-4,7,10,13,16,19
-Docosahexaenoate (C22:6n3)

Column : ULBON HR-SS-10 50 m x 0.25 mm I.D.
 Column temp : 150 °C ~ 220 °C Program rate 3 °C/min
 Injection : 250 °C (Split ratio: 60 :1)
 Detector : FID (250 °C)
 Carrier gas : He, 0.8 mL/min
 Sample Volume: 1.0 μ L

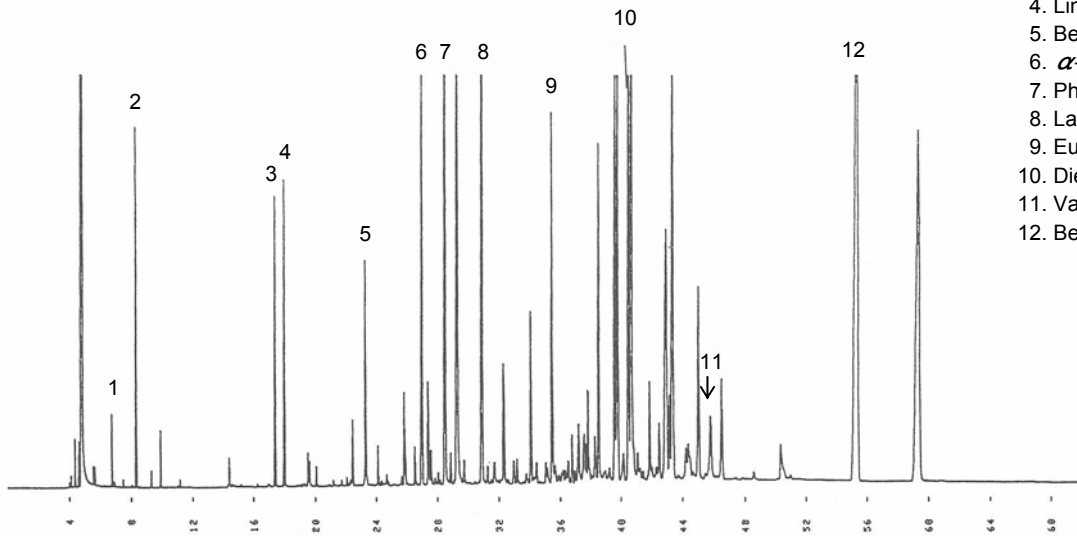
Perfume (1)



1. α -Pinene
2. β -Pinene
3. Limonene
4. Linalool
5. Linalyl Acetate
6. Benzyl Acetate
7. Phenethyl Alcohol

Column : ULBON HR-Thermon-600T 50 m x 0.25 mm I.D.
 Column temp : 70 °C ~ 230 °C Program rate 4 °C/min
 Injection : 250 °C (Sprit ratio: 80 : 1)
 Detector : FID (250 °C)
 Carrier gas : He, 1.1 mL/min
 Sample Volume: 1.0 μ L

Perfume (2)

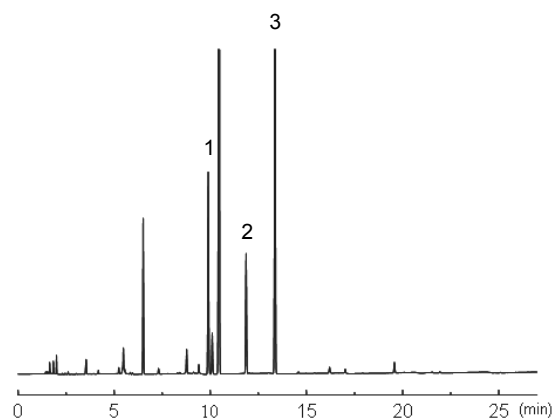


1. β -Pinene
2. Limonene
3. Linalool
4. Linalyl Acetate
5. Benzyl Acetate
6. α -Ionene
7. Phenethyl Alcohol
8. Lauryl Alcohol
9. Eugenol
10. Diethyl Phthalate
11. Vanillin
12. Benzyl Salicylate

Column : ULBON HR-Thermon-600T 50 m x 0.25 mm I.D.
 Column temp : 70 °C ~ 230 °C Program rate 4 °C/min
 Injection : 250 °C (Sprit ratio: 80 : 1)
 Detector : FID (250 °C)
 Carrier gas : He, 1.1 mL/min
 Sample Volume: 1.0 μ L

Narcissus

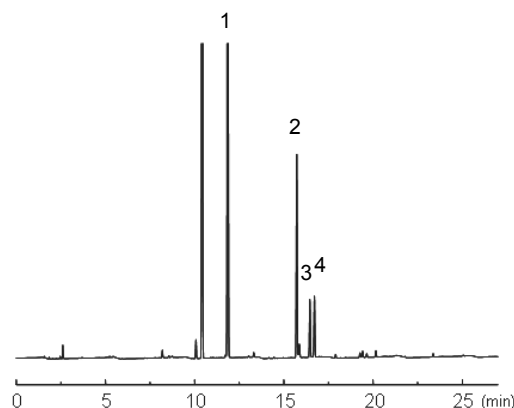
1. 1,8-Cineole
2. β -Phenethyl Alcohol
3. Benzyl Acetate



Column : ULBON HR-1 30 m x 0.32 mm I.D.df = 0.25 μ m
 Column temp : 50 $^{\circ}$ C ~ 200 $^{\circ}$ C Program rate 5 $^{\circ}$ C/min
 Injection : 250 $^{\circ}$ C (Sprit ratio: 10 :1)
 Detector : FID (250 $^{\circ}$ C)
 Carrier gas : He, 2.4 mL/min

Fragrant daphne

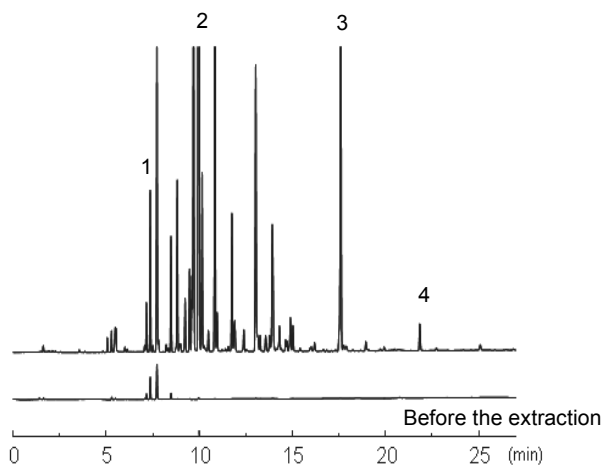
1. Linalool
2. Anisaldehyde
3. Geraniol
4. Perillaldehyde



Column : ULBON HR-1 30 m x 0.32 mm I.D.df = 0.25 μ m
 Column temp : 50 $^{\circ}$ C ~ 200 $^{\circ}$ C Program rate 5 $^{\circ}$ C/min
 Injection : 250 $^{\circ}$ C (Sprit ratio: 10 :1)
 Detector : FID (250 $^{\circ}$ C)
 Carrier gas : He, 2.4 mL/min

Rosemary

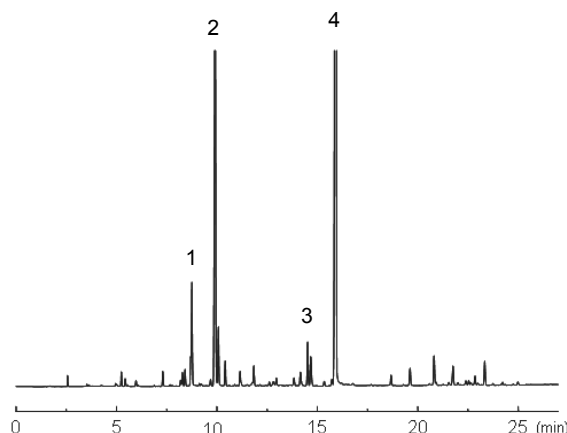
1. α -Pinene
2. Limonene
3. Isobornyl Acetate
4. α -Ionone



Column : ULBON HR-1 30 m x 0.32 mm I.D.df = 0.25 μ m
 Column temp : 50 $^{\circ}$ C ~ 200 $^{\circ}$ C Program rate 5 $^{\circ}$ C/min
 Injection : 250 $^{\circ}$ C (Sprit ratio: 10 :1)
 Detector : FID (250 $^{\circ}$ C)
 Carrier gas : He, 2.4 mL/min

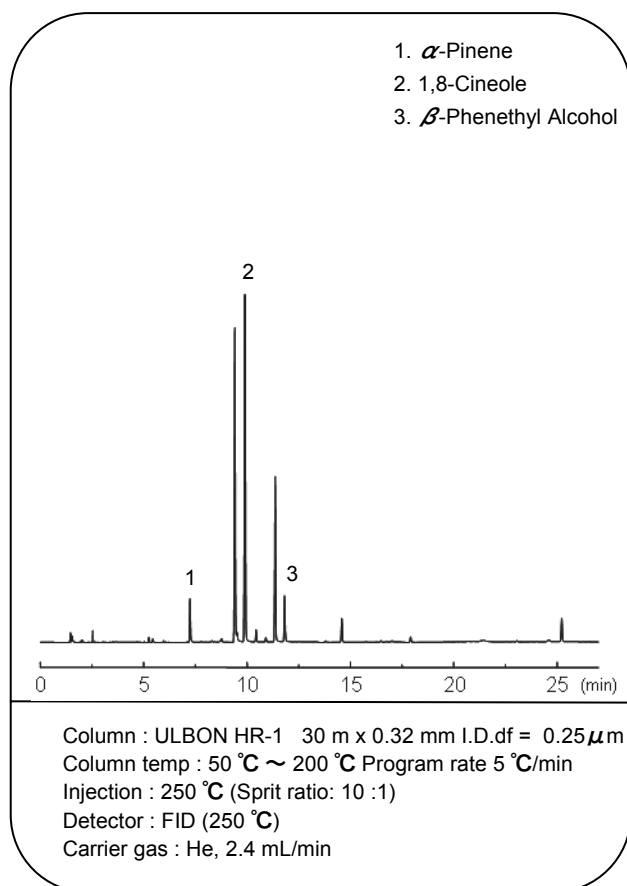
Peppermint

1. Myrcene
2. 1,8-Cineole
3. L-Menthol
4. Anisaldehyde

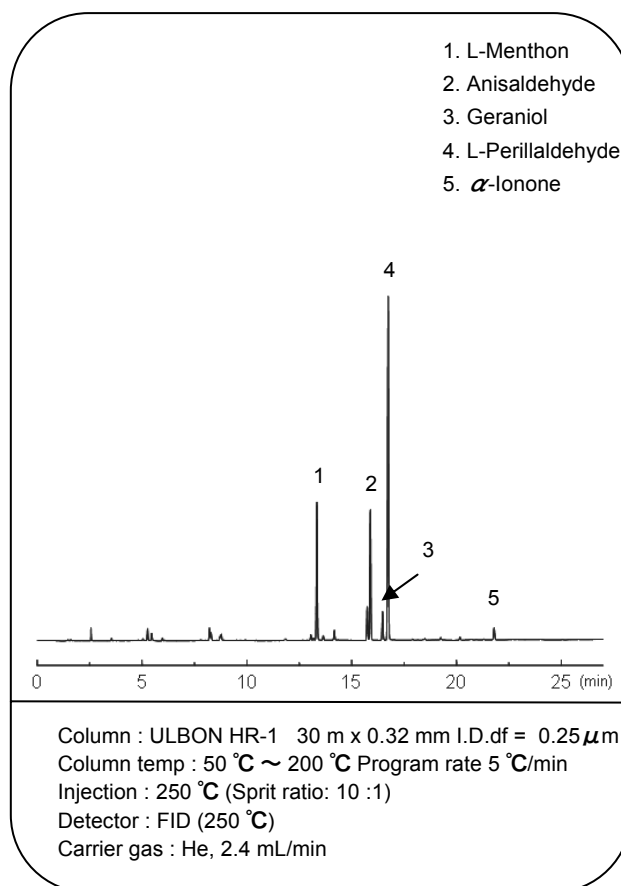


Column : ULBON HR-1 30 m x 0.32 mm I.D.df = 0.25 μ m
 Column temp : 50 $^{\circ}$ C ~ 200 $^{\circ}$ C Program rate 5 $^{\circ}$ C/min
 Injection : 250 $^{\circ}$ C (Sprit ratio: 10 :1)
 Detector : FID (250 $^{\circ}$ C)
 Carrier gas : He, 2.4 mL/min

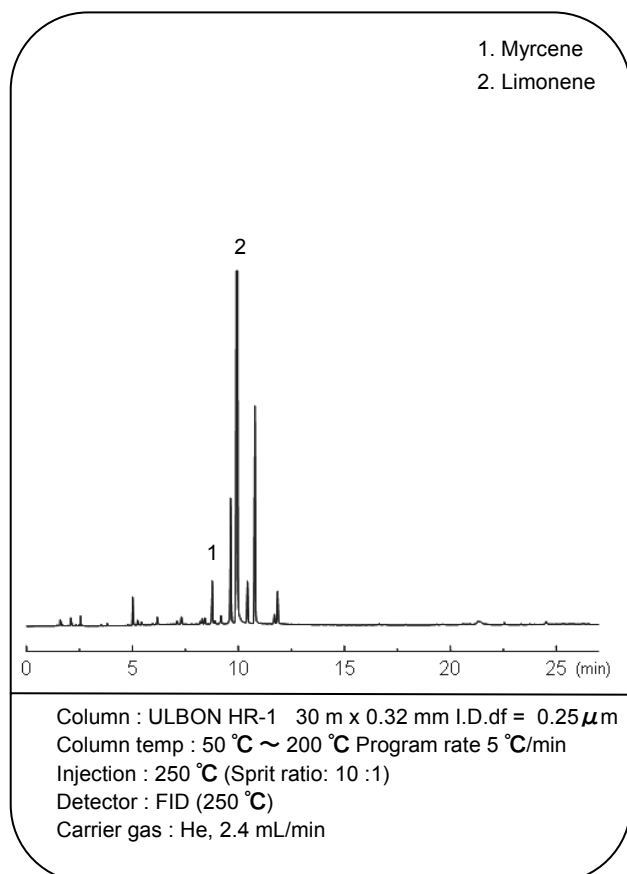
Angels trumpet



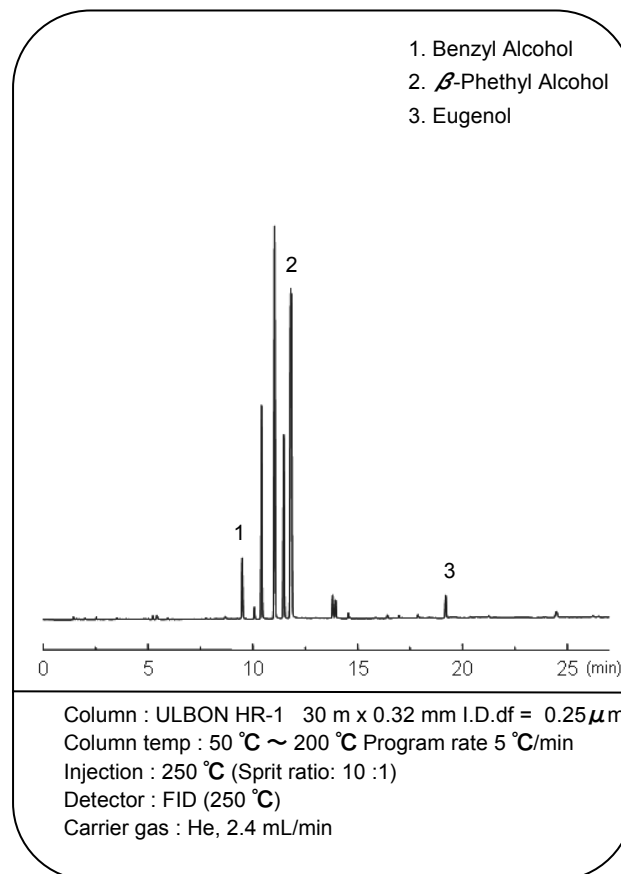
Lemon balm



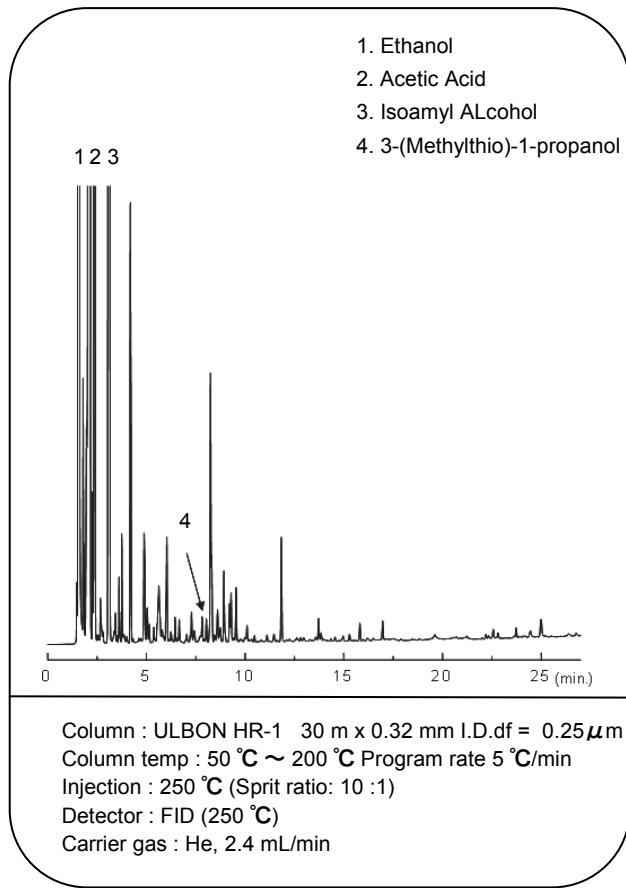
Yuzu citron



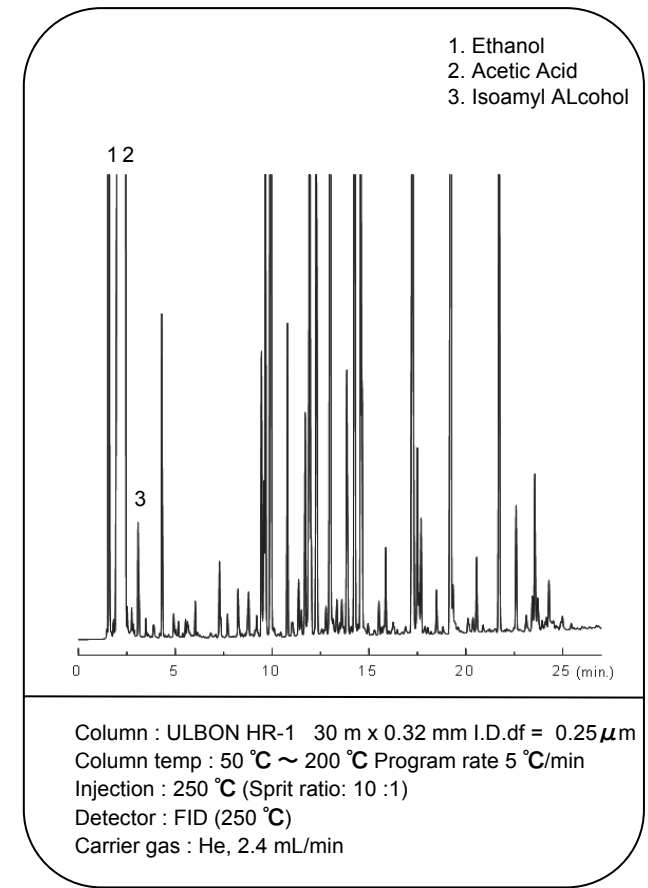
Holly tree



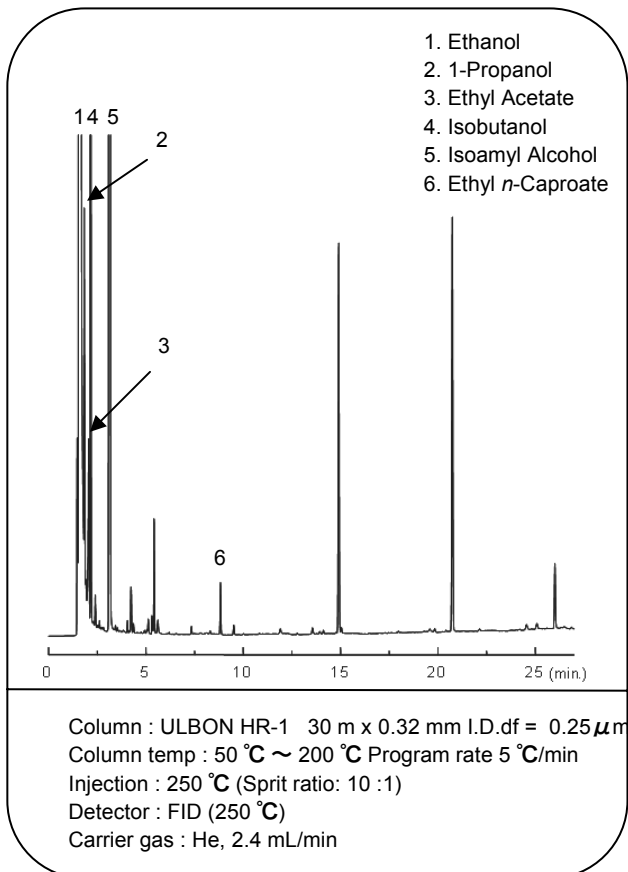
Soy sauce



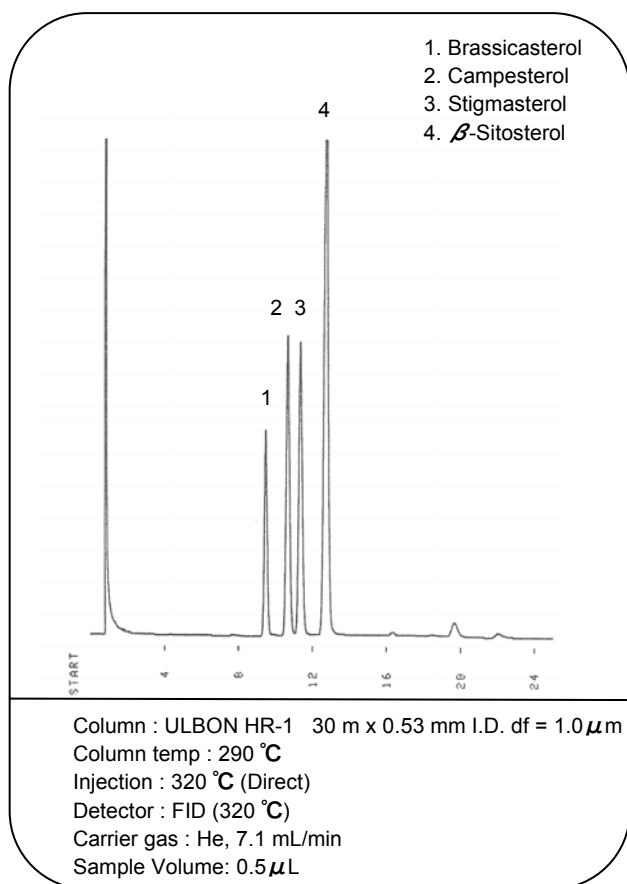
Worcestershire sauce



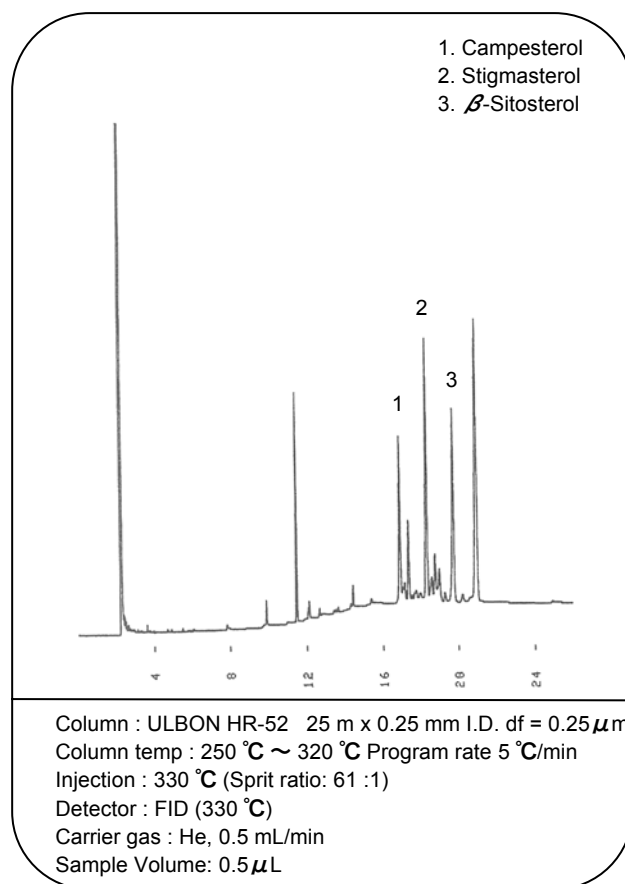
Brandy



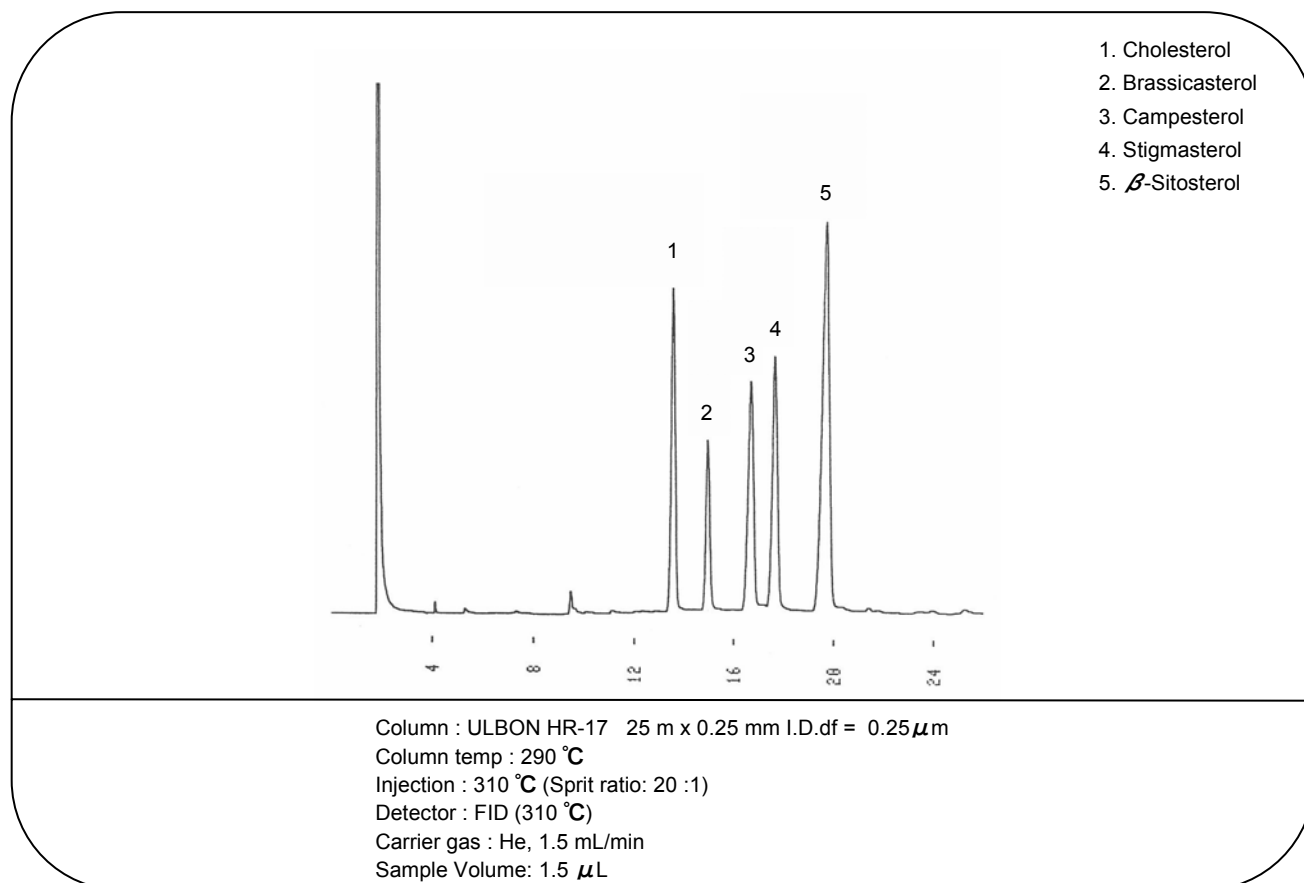
Plant sterols



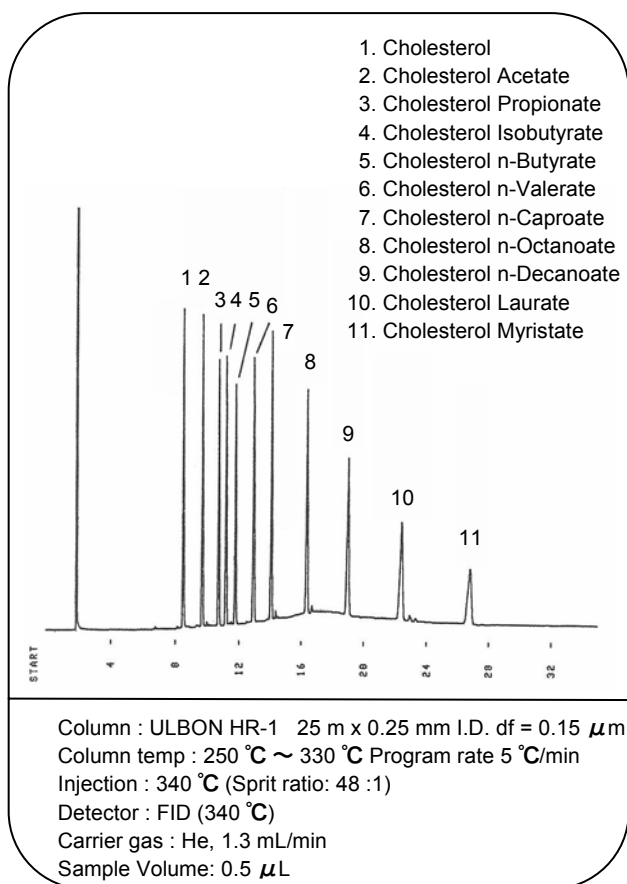
Plant sterols in rice bran oil



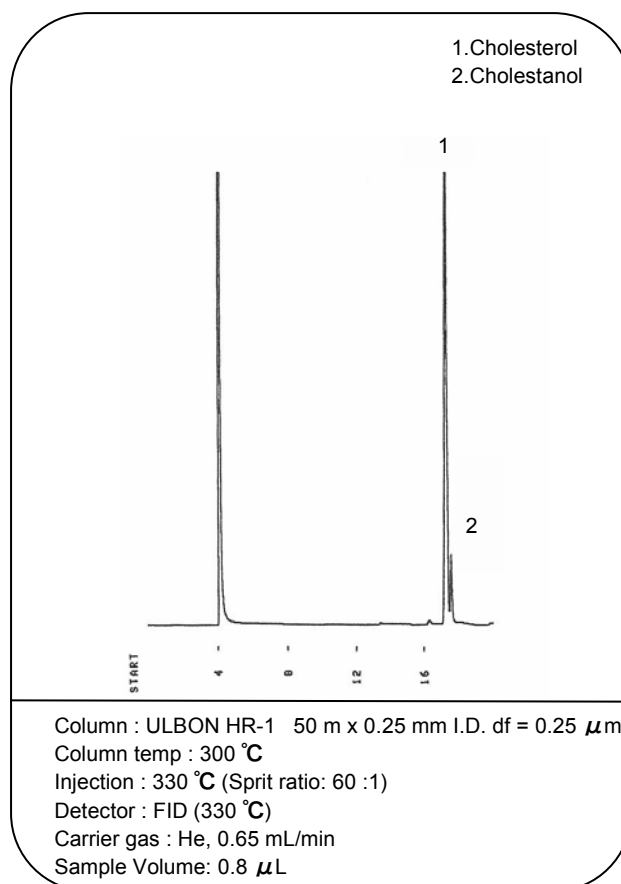
Cholesterol and Plant sterols



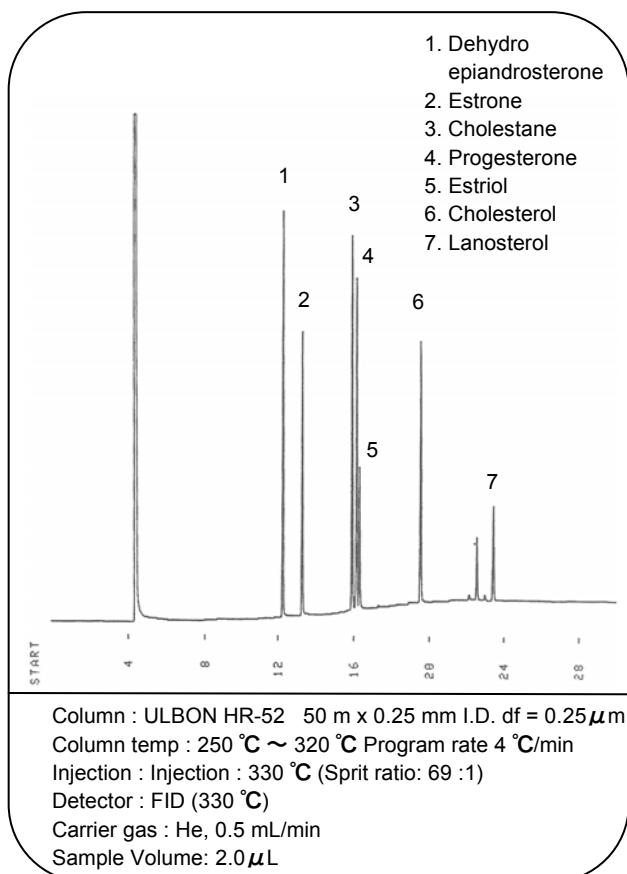
Cholesterol esters



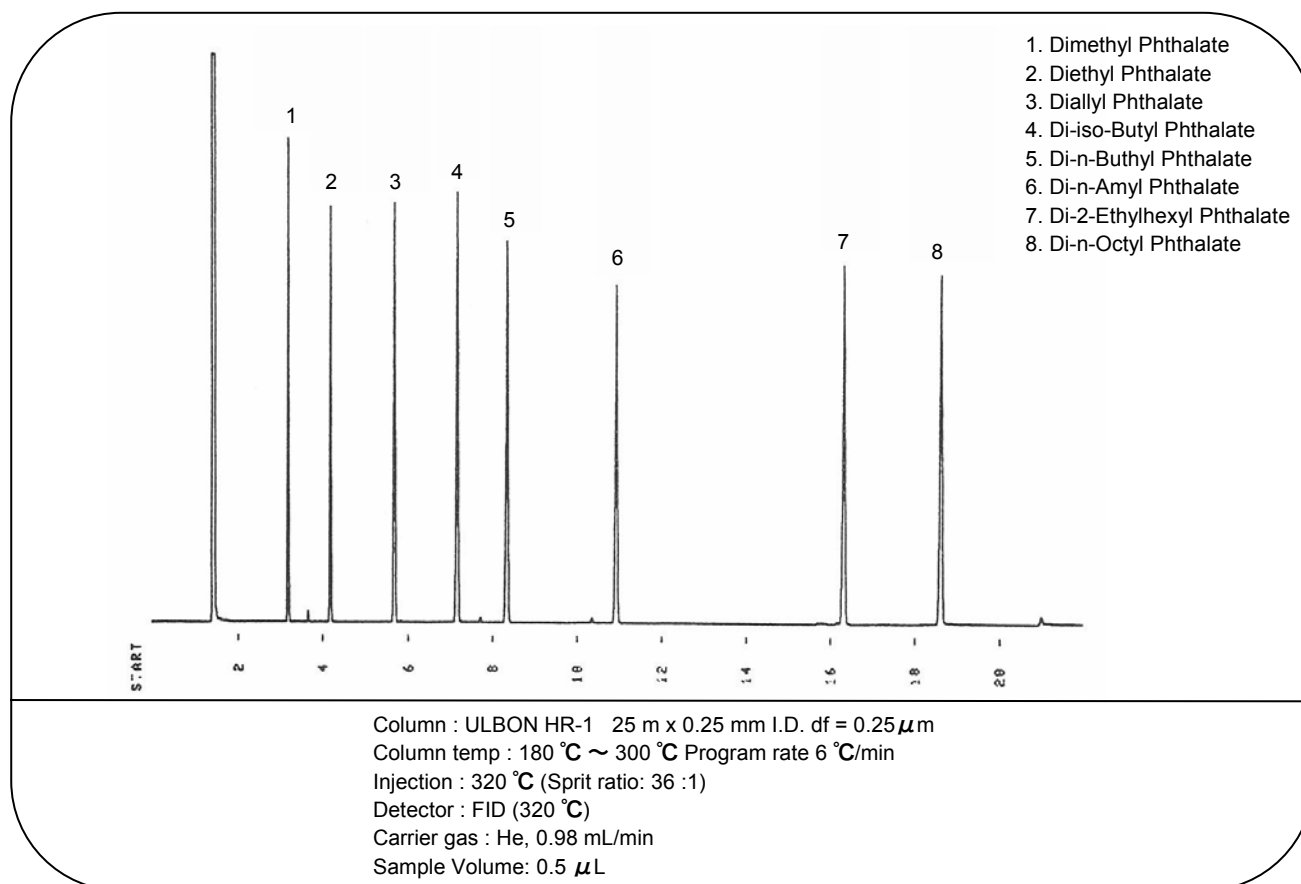
Cholesterol & Cholestanol



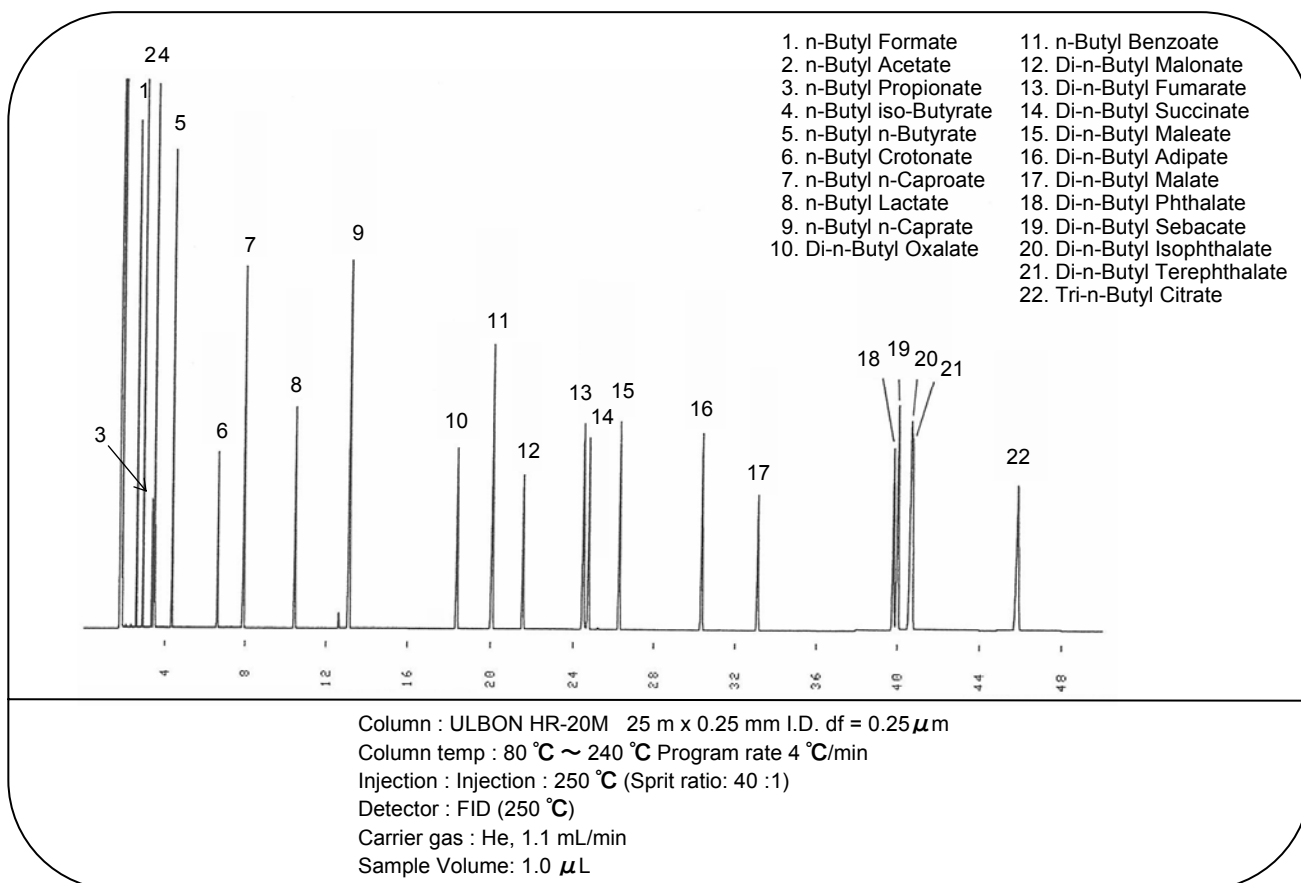
Sterols



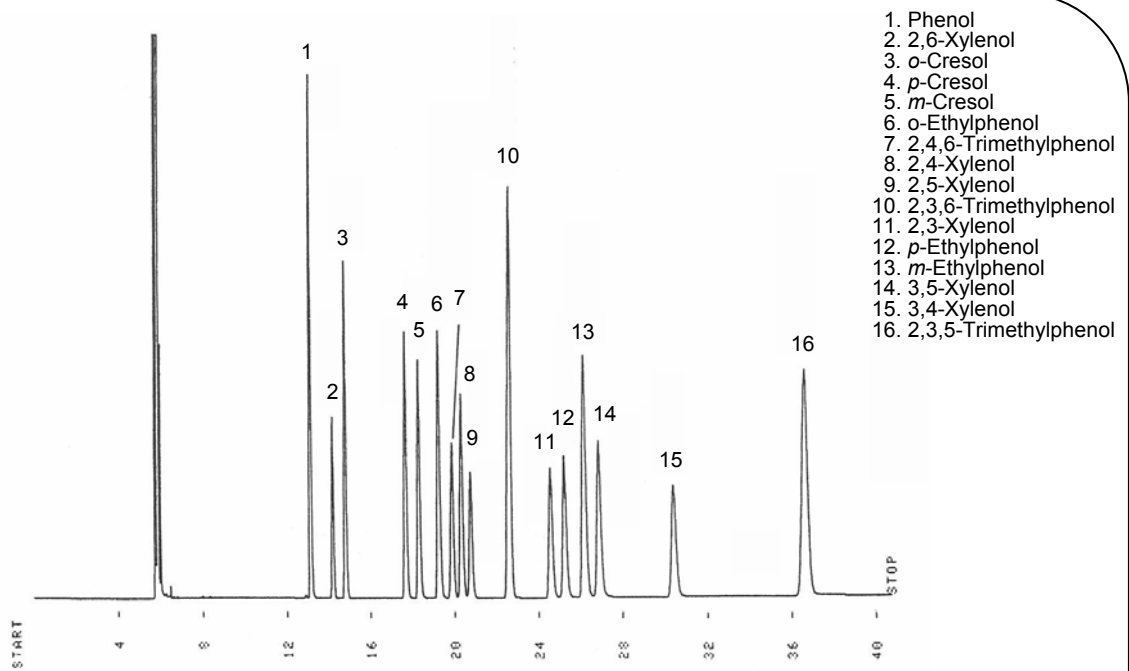
Phthalic acid esters



Organic acid butyl esters

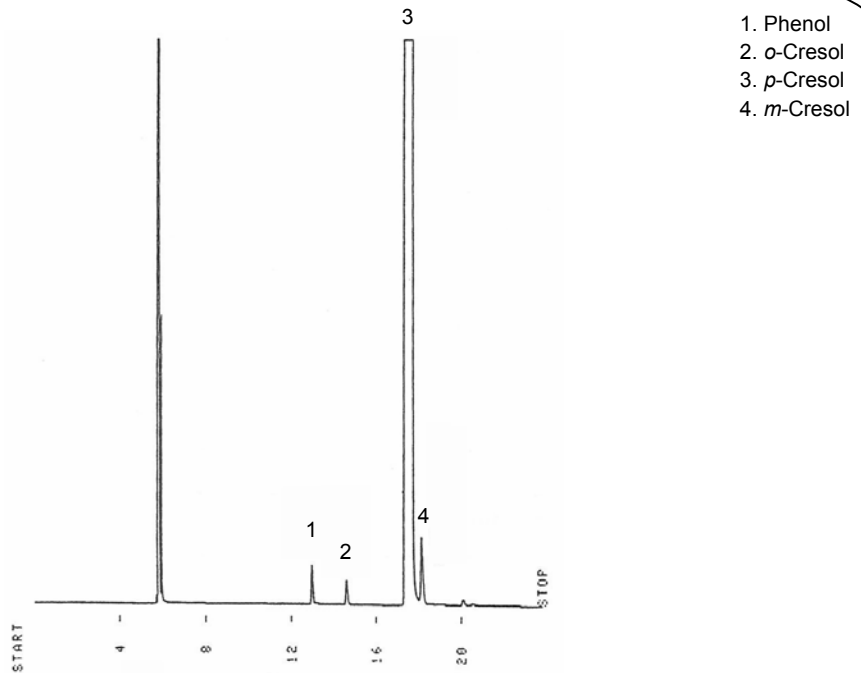


Alkylphenol isomers



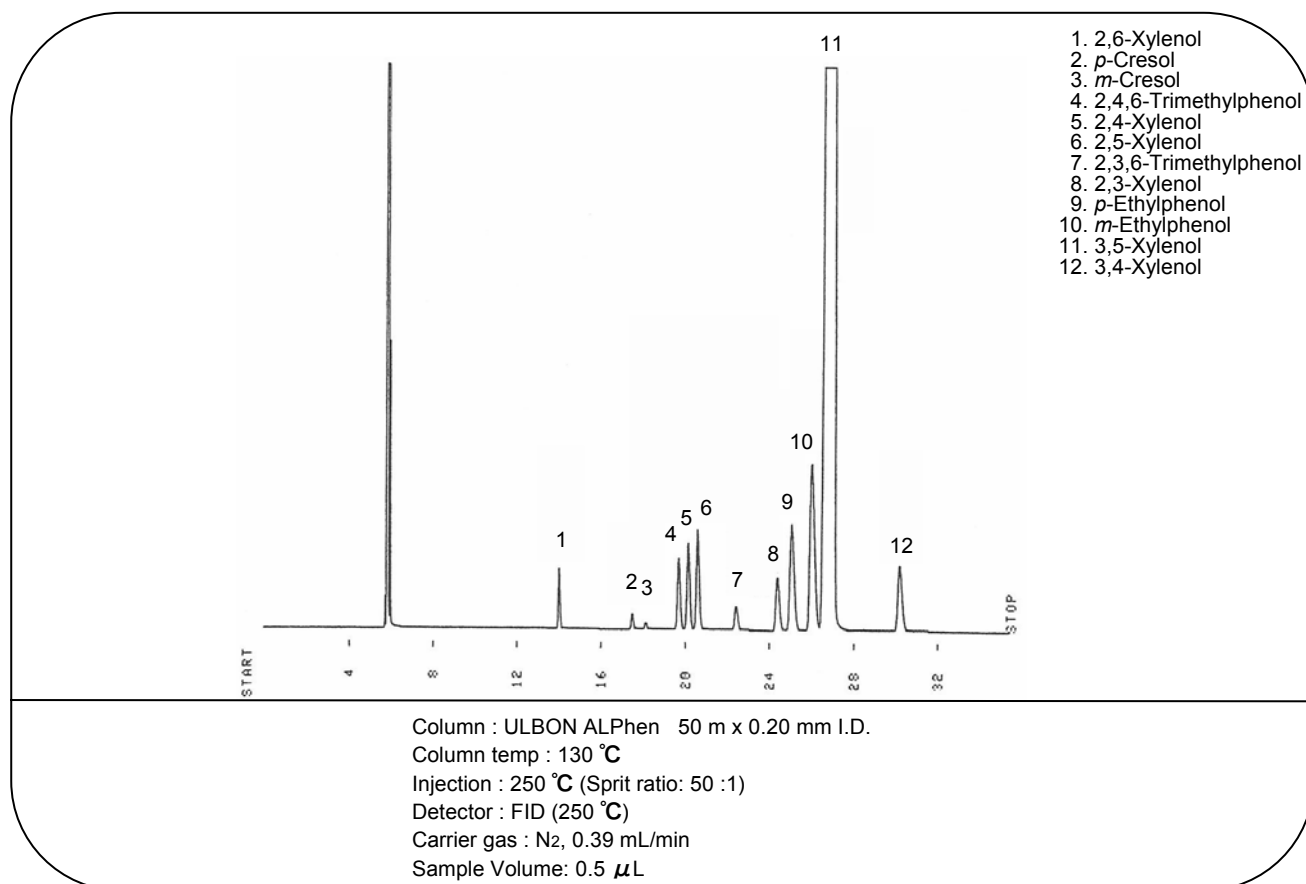
Column : ULBON ALPhen 50 m x 0.20 mm I.D.
 Column temp : 130 °C
 Injection : 250 °C (Sprit ratio: 70 :1)
 Detector : FID (250 °C)
 Carrier gas : N₂, 0.39 mL/min
 Sample Volume: 0.5 μL

m-Cresol in *p*-Cresol (10% benzene solution)

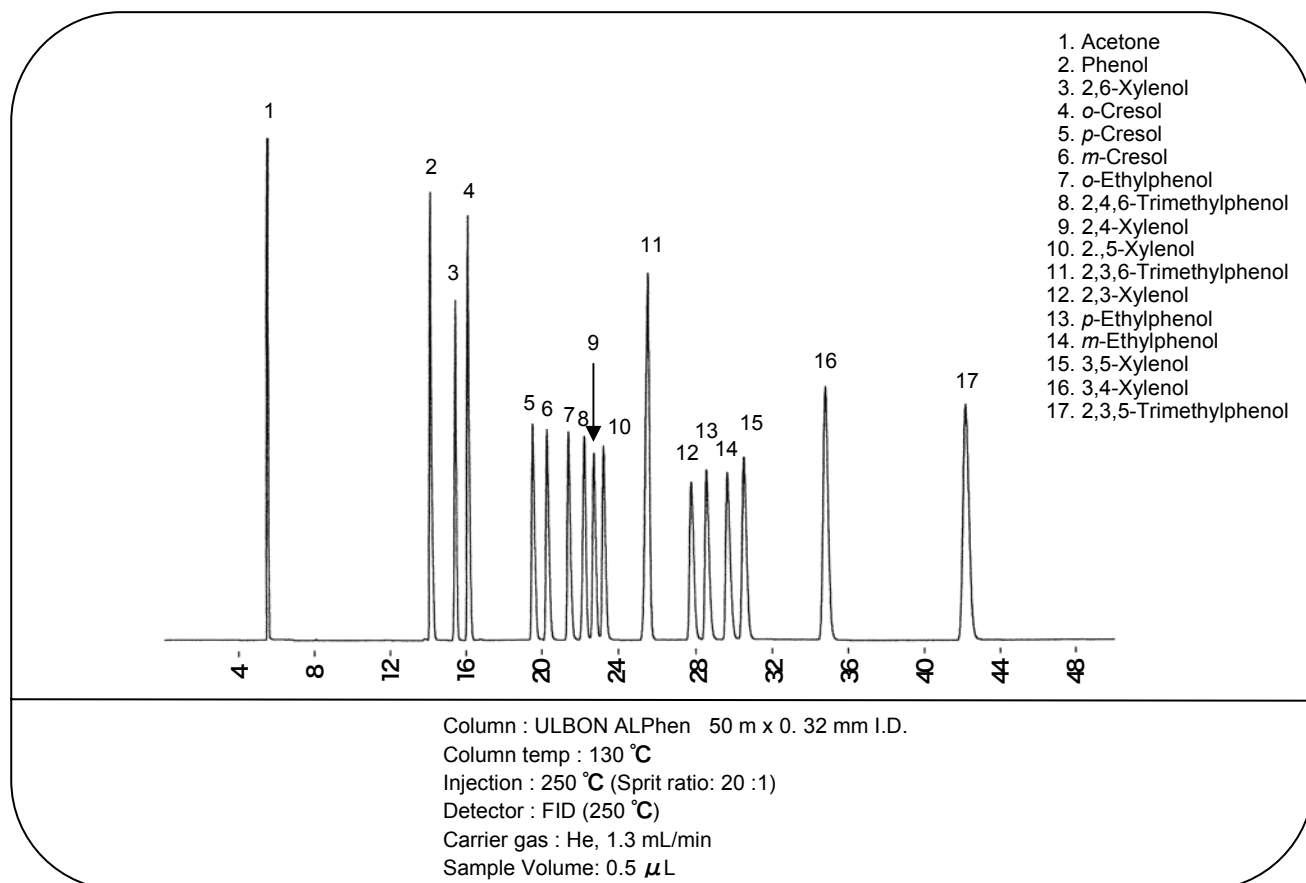


Column : ULBON ALPhen 50 m x 0.20 mm I.D.
 Column temp : 130 °C
 Injection : 250 °C (Sprit ratio: 50 :1)
 Detector : FID (250 °C)
 Carrier gas : N₂, 0.39 mL/min
 Sample Volume: 0.5 μL

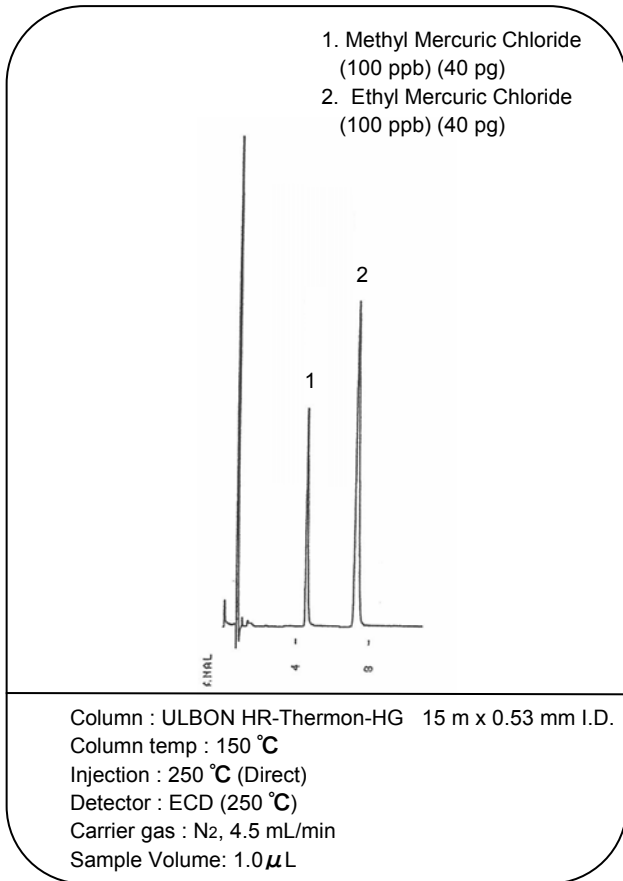
Impurities in 3,5-xyleneol (10% benzene solution)



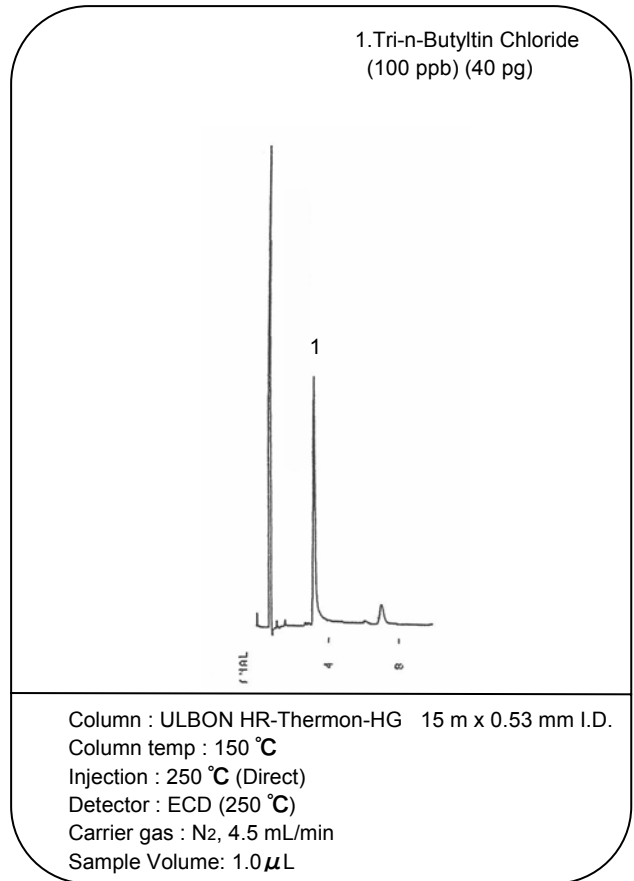
Alkylphenol mixture (0.1 ~ 0.3% Acetone solution)



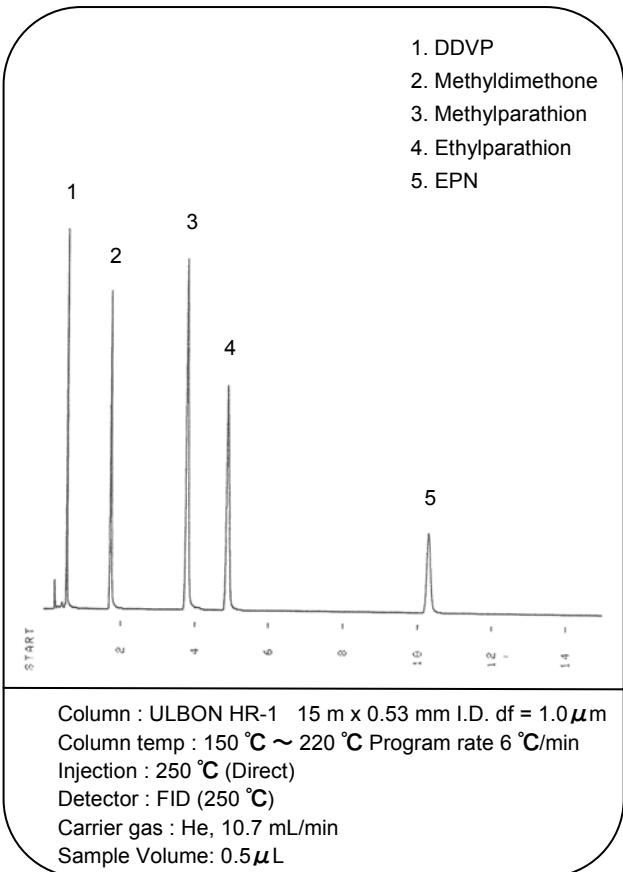
Alkyl Mercury



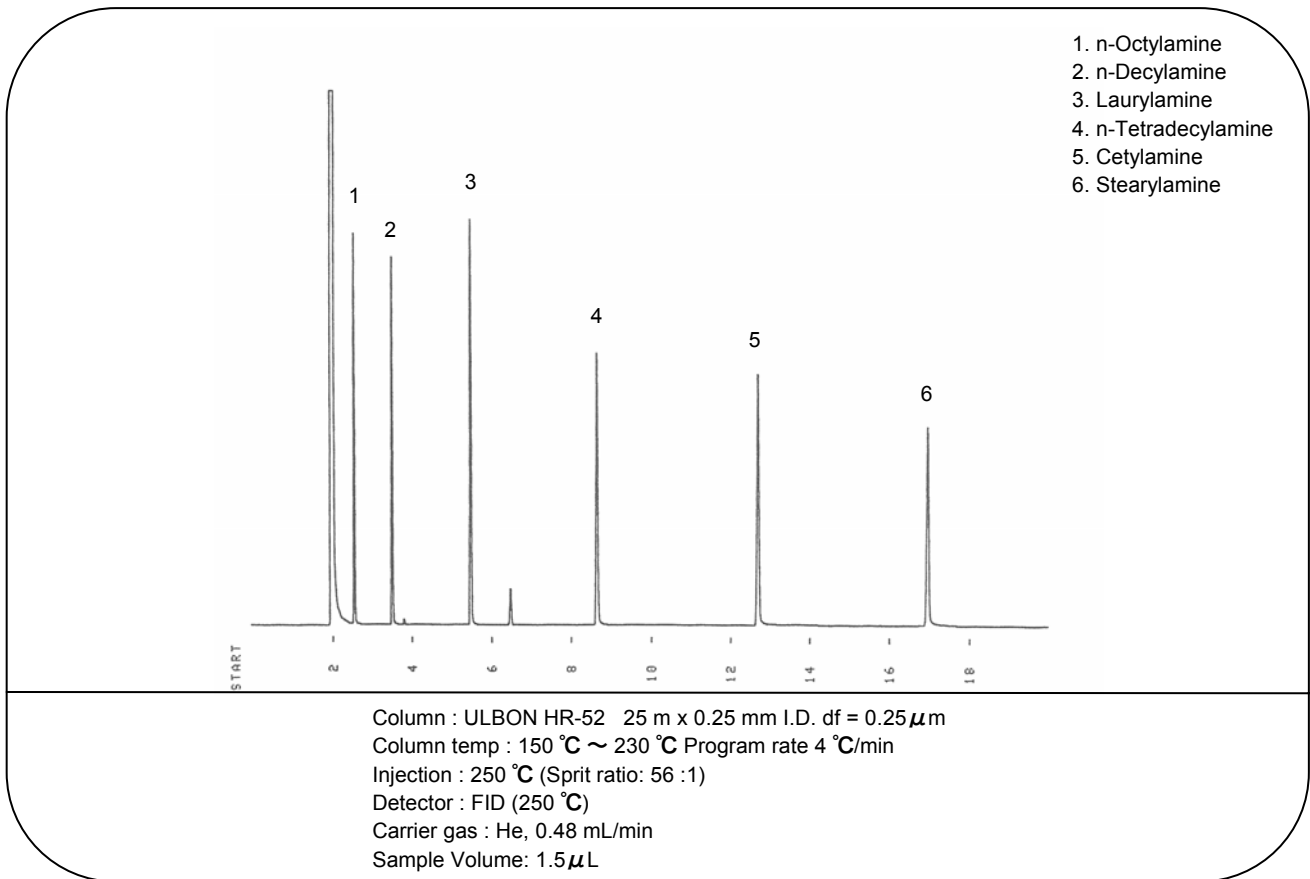
Tri-*n*-Butyltin Chloride



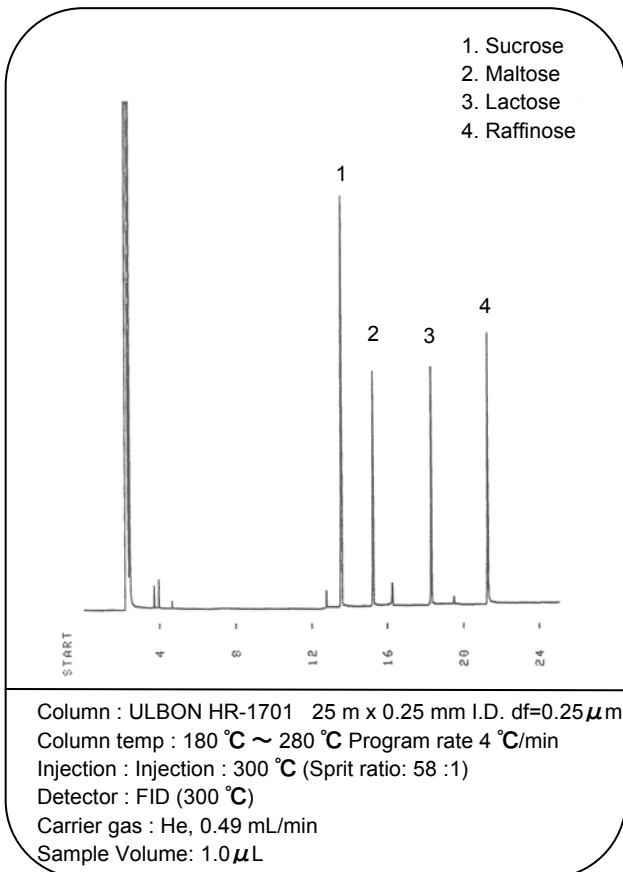
Organic phosphorus pesticides



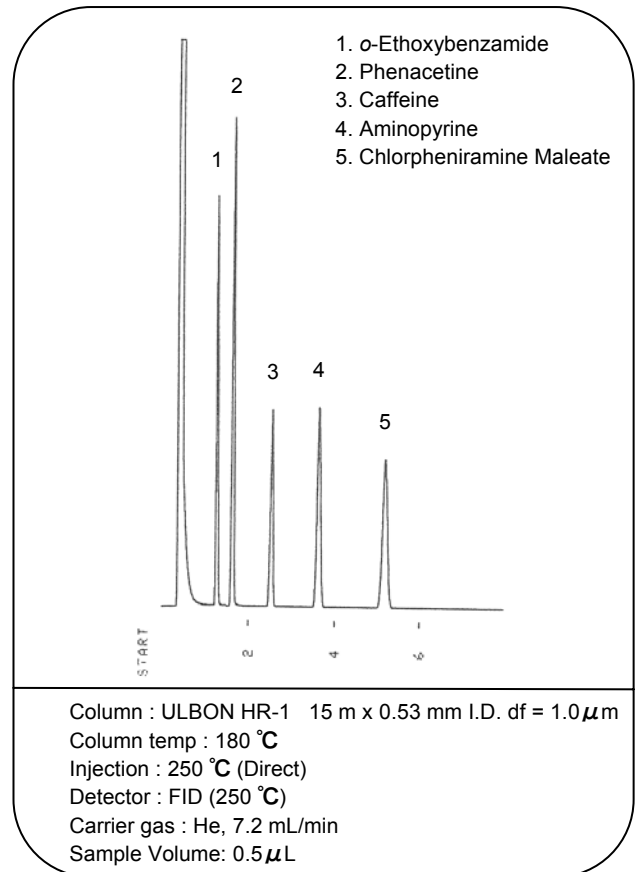
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Sugars (Acetate)



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