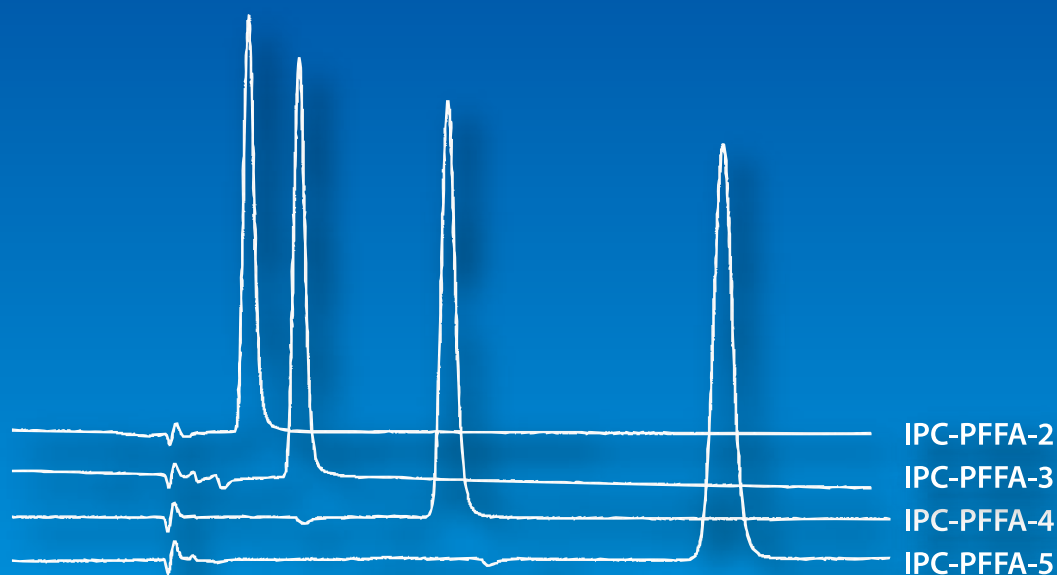


Ion-Pair Reagents for HPLC



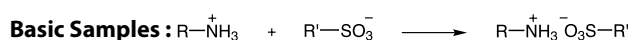
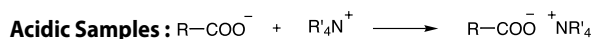
Ion-Pair Chromatography for Acidic Samples

Ion-Pair Chromatography for Basic Samples

Fluorimetric Ion-Pair Reagent

Ion-Pair Reagents for HPLC

Ion-exchange chromatography systems have previously been utilized in HPLC analysis of ionic samples. Recently, reversed phase partition chromatography using ion-pair reagents has been developed and utilized. The ionic samples form an ion-pair with ion-pair reagents in the mobile phase to become electrically neutral. The increase in hydrophobic character of the ion-pair results in a greater affinity for the reverse stationary phase and leads to sample resolution.



UV and fluorescence detectors are widely used. Therefore ion-pair reagents must lack UV absorption and fluorescence

themselves to obtain highly sensitive detection of samples. The UV absorption of sodium alkanesulfonates and quaternary ammonium salts is minimal so that these reagents can be used for reliable HPLC analysis. On the other hand, when a sample lacks sufficient UV absorption or fluorescence, the use of sodium 9,10-dimethoxyanthracene-2-sulfonate allows for high-sensitivity detection as a fluorimetric ion-pair reagent.

Recently, use of LC-MS in which mass spectrometry is incorporated in HPLC as a detector has become widespread. Sodium alkanesulfonates, a general ion-pair reagents, being non-volatile crystals pose a problem in that they contaminate the interface. The IPC-PFFA series is made of highly volatile ion-pair reagents allowing for continuous LC-MS analysis without contaminating the interfaces.

Ion-Pair Chromatography for Acidic Samples

- Analysis is performed with pH adjusted to 7.5 with the addition of quaternary ammonium salts to the mobile phase.
- Acidic samples form an electrically neutral ion-pair with the quaternary ammonium salt and are retained in the reverse phase systems.
- The ion-pair reagents for acidic samples for LC-MS are supplied as 0.5 M aqueous solutions and were adjusted to pH 7.5. The solution can be used as a neutral mobile phase after dilution with the LC solvents (acetonitrile/water or methanol/water) to 5 mM. Since the acidic substances are ionized under the neutral conditions, they are facilitated to form an ion-pair.

[Examples]

1. When 0.5 mol/L Tetrabutylammonium Phosphate is used:

The reagent (10 mL) is diluted to 1 L with an aqueous solvent such as methanol - water.
(pH adjustment is not required because the reagent is already buffered.)

2. When Tetrabutylammonium Hydroxide is used:

- 1) The reagent (12.5 mL) is diluted to 1 L with an aqueous solvent such as methanol - water.
- 2) The pH is adjusted to 7.5 by the addition of an aqueous phosphoric acid (10%).

| | | | |
|--------------------------|--------|--|------------|
| $R_4-\overset{+}{N} X^-$ | I 0363 | IPC-TEA-OH (Tetraethylammonium Hydroxide) (10% in Water) | 25ml |
| | I 0364 | IPC-TBA-OH (Tetrabutylammonium Hydroxide) (10% in Water) | 25ml |
| | I 0365 | IPC-TBA-Br (Tetrabutylammonium Bromide) | 25g 500g |
| | I 0366 | IPC-TBA-Cl (Tetrabutylammonium Chloride) | 5g 25g |
| | I 0367 | IPC-TBA-P (Tetrabutylammonium Phosphate) (0.5mol/L in Water) | 10ml 100ml |
| | I 0368 | IPC-TBA-HS (Tetrabutylammonium Hydrogen Sulfate) | 25g 100g |
| | I 0453 | IPC-DTMA-Cl (Dodecyltrimethylammonium Chloride) | 25g 500g |

for LC-MS

| | | | |
|-----------------------------|-------|---|------------|
| $R_2-\overset{+}{NH}_2 X^-$ | A5703 | IPC-DPAA (Dipropylammonium Acetate) (ca. 0.5mol/L in Water) | 10ml |
| | A5702 | IPC-DBAA (Dibutylammonium Acetate) (ca. 0.5mol/L in Water) | 10ml 100ml |
| | A5704 | IPC-DAAA (Diamylammonium Acetate) (ca. 0.5mol/L in Water) | 10ml |
| | A5705 | IPC-DHAA (Dihexylammonium Acetate) (ca. 0.5mol/L in Water)..... | 10ml |

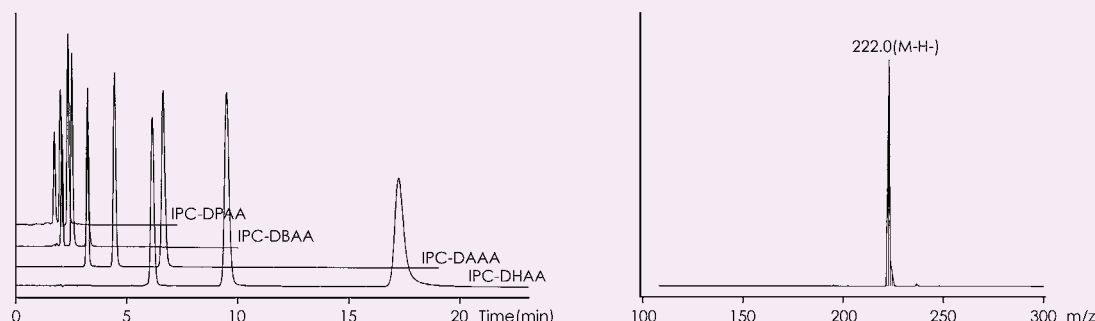
Using of IPC-DRAA

Aminonaphthalenesulfonic Acid

Column : Kaseisorb LC ODS 2000
2.0 mm I.D. X 150 mm
Mobile phase : CH₃CN / H₂O = 30 / 70
containing 5mM IPC Reagent
(Dialkylammonium Acetate)
Flow rate : 0.2 mL/min
Temperature : 25°C

Detection : UV 254 nm
MS : 1100 MSD (Agilent)
ESI (Negative)

Sample : 1. 4-Amino-1-naphthalenesulfonic Acid
2. 1-Amino-8-naphthalenesulfonic Acid
3. 8-Amino-2-naphthalenesulfonic Acid



Ion-Pair Chromatography for Basic Samples

- Analysis is performed by the addition of sodium alkanesulfonate to the mobile phase. The basic samples form an electrically neutral ion-pair with sodium alkanesulfonate and are retained in the reverse phase system.
- In the case of sodium alkanesulfonate, the greater the number of carbons in the alkyl group, the greater the partition ratio.
- The solubility of the products such as sodium 1-decanesulfonate (IPC-ALKS-10) may decrease depending upon the composition of the mobile phase solvents; especially after the addition of the buffer for pH adjustment. Resulted turbidity of the mobile phase and crystal formation may interfere with the analysis. To avoid the trouble, modification of the solvent system composition should be considered.
- The ion-pair reagents for basic samples in LC-MS analysis are supplied as 0.5 M aqueous solutions. The solution can be used as an acidic mobile phase after dilution with the LC solvents (acetonitrile/water or methanol/water) to 5 mM. Since the basic substances are ionized under the acidic conditions, they are facilitated to form an ion-pair.
- We launched the high-quality products of PFFA-6, 7 and 8 (A5722, A5721, A5720) for high-sensitive detections.

[Examples]

- 1) Sodium 1-Heptanesulfonate 1.011 g (0.005 mol) is weighed out.
- 2) The reagent is dissolved in 1 L of an aqueous solvent such as methanol - water.
- 3) The pH is adjusted to 3.5 by the addition of aqueous phosphoric acid (50%).

| | | | | | |
|-----------------|--------|-------------|-------------------------------|----------|------|
| $R-SO_3^- Na^+$ | I 0341 | IPC-ALKS-3 | (Sodium 1-Propanesulfonate) |5g | 25g |
| | I 0342 | IPC-ALKS-4 | (Sodium 1-Butanesulfonate) |5g | 25g |
| | I 0343 | IPC-ALKS-5 | (Sodium 1-Pentanesulfonate) |5g | 25g |
| | I 0344 | IPC-ALKS-6 | (Sodium 1-Hexanesulfonate) |5g | 25g |
| | I 0345 | IPC-ALKS-7 | (Sodium 1-Heptanesulfonate) |5g | 25g |
| | I 0346 | IPC-ALKS-8 | (Sodium 1-Octanesulfonate) |5g | 25g |
| | I 0347 | IPC-ALKS-9 | (Sodium 1-Nonanesulfonate) |5g | 25g |
| | I 0348 | IPC-ALKS-10 | (Sodium 1-Decanesulfonate) |5g | 25g |
| | I 0349 | IPC-ALKS-11 | (Sodium 1-Undecanesulfonate) |5g | 25g |
| | I 0350 | IPC-ALKS-12 | (Sodium 1-Dodecanesulfonate) |5g | 25g |
| | I 0351 | IPC-ALKS-13 | (Sodium 1-Tridecanesulfonate) |5g | 25g |
| | I 0352 | IPC-SDS | (Sodium Dodecylsulfate) |25g | 500g |

for LC-MS

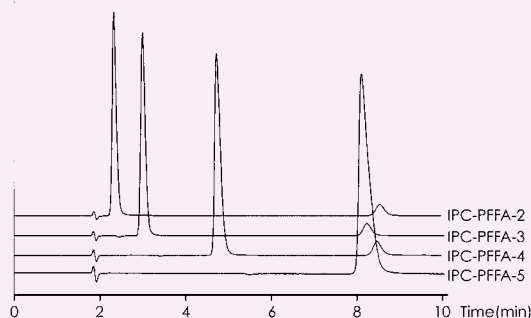
| | | | | | |
|-----------|-------|------------|---|--------------|--|
| $Rf-COOH$ | A5711 | IPC-PFFA-2 | (Trifluoroacetic Acid) (ca. 0.5mol/L in Water) |10ml | |
| | A5712 | IPC-PFFA-3 | (Pentafluoropropionic Acid) (ca. 0.5mol/L in Water) |10ml | |
| | A5713 | IPC-PFFA-4 | (Heptafluorobutyric Acid) (ca. 0.5mol/L in Water) |10ml | |
| | A5714 | IPC-PFFA-5 | (Nonafluorovaleric Acid) (ca. 0.5mol/L in Water) |10ml | |
| | A5715 | IPC-PFFA-6 | (Undecafluorohexanoic Acid) (ca. 5mmol) |1sample | |
| | A5716 | IPC-PFFA-7 | (Tridecafluoroheptanoic Acid) (ca. 5mmol) |1sample | |

| | | |
|---|-------|---------|
| A5717 IPC-PFFA-8 (Pentadecafluorooctanoic Acid) (ca. 5mmol) | | 1sample |
| A5722 IPC-PFFA-6 High Grade | | 1g 5g |
| A5721 IPC-PFFA-7 High Grade | | 1g 5g |
| A5720 IPC-PFFA-8 High Grade | | 1g 5g |

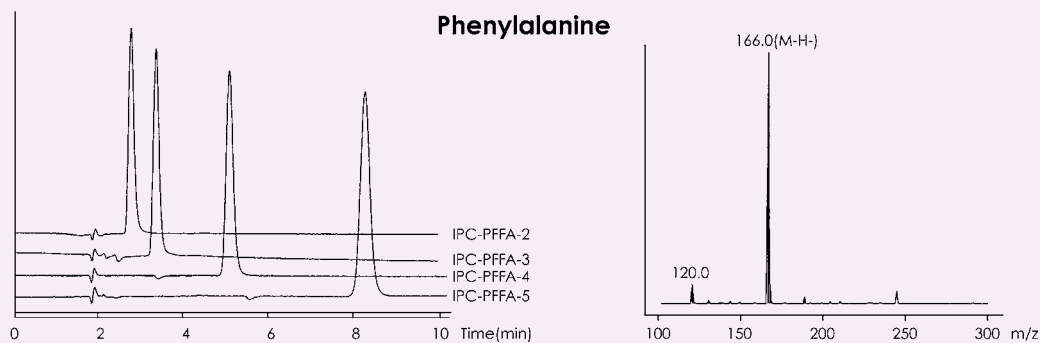
Using of IPC-PFFA

| | | | |
|--------------|--|-------------|--|
| Column | : Kaseisorb LC ODS 2000 2.0 mm I.D. X 150 mm | Temperature | : 25°C |
| Mobile phase | : CH ₃ OH / H ₂ O = 40 / 60 containing 5 mM IPC Reagent | Detection | : UV 254 nm |
| Flow rate | : 0.2 mL/min | MS | : 1100 MSD (Agilent) ESI (Positive) |

Benzylamine



Phenylalanine



Fluorimetric Ion-Pair Reagent

| | | |
|---|-------|----|
| A5701 Sodium 9,10-Dimethoxyanthracene-2-sulfonate | | 1g |
|---|-------|----|

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