

# LC/MS analysis of various anionic substances using polymer-based multimode column

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## Abstract

Anionic substances analyzed by reverse phase mode generally require pretreatment of the sample by derivatization or addition of ion pair reagent to the eluent. In this study, a multimode column (RP + anion exchange or HILIC), with polyvinyl alcohol packing material modified with quaternary ammonium functional groups was used under conditions without derivatization or ion pair reagent for the LC/MS analysis of various anionic substances.

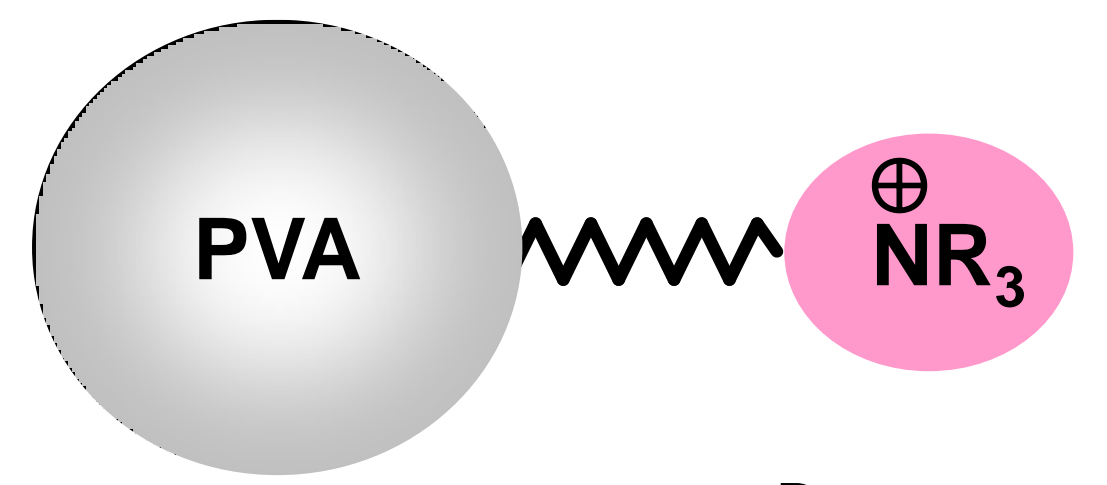
One example of this column applies to the analysis of haloacetic acids which are common undesirable disinfection byproducts (DBPs) generated during water purification. In the past, GC/MS was used as the standard method for haloacetic acid analysis; three haloacetic acids (monochloroacetic acid, dichloroacetic acid, and trichloroacetic acid) were simultaneously analyzed by LC/MS with the multimode column. The optimized eluent condition was 25 mM CH<sub>3</sub>COONH<sub>4</sub> aq. (pH 9.2)/CH<sub>3</sub>CN = 50/50. The flow rate was 0.2 mL/min, and the column temperature was 30 deg-C. ESI-MS with SIM and MRM mode was used for detection. The mixed standard solution (2 ng/mL of each) was analyzed. All peak shapes were sharp with baseline separation, and the calibration curves showed high linearity. Tap water was analyzed without interference of detection. We will also introduce the applications of other substances (e.g. oxyhalides including perchloric acid, iodine ion, organic acids, allantoin, and phosphorylated saccharides). The multimode column is useful for the LC/MS analysis of various anionic substances using more simple conditions than previous methods.

## New HILIC column, Shodex™ HILICpak VT-50 2D<sup>※</sup>

※The name of VT-50 is development code

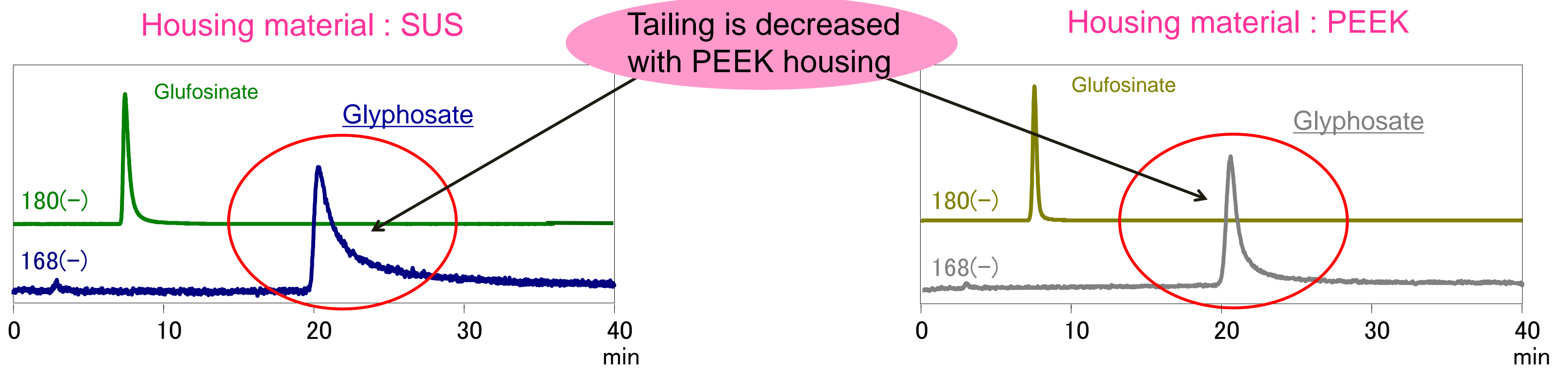
### Product specifications

Base material	: Polyvinyl alcohol
Housing material	: PEEK
Column size	: 2.0 × 150 (mm)



- Combination of HILIC mode and ion exchange mode
- Suitable for hydrophilic and anionic analytes
- Possible to analyze substances that would normally be adsorbed on SUS housing

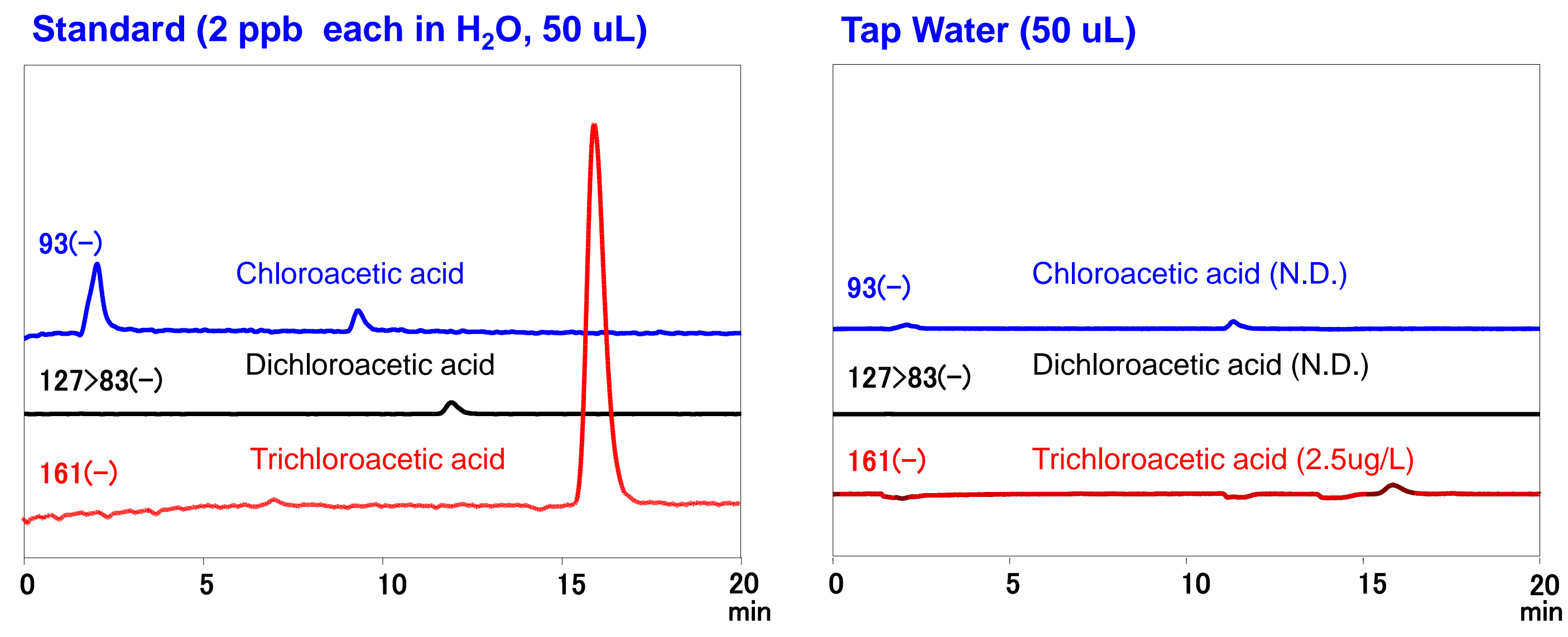
### Example of difference of housing material



Eluent : (A) H<sub>2</sub>O/HCOOH=100/0.2(V/V) / (B) CH<sub>3</sub>CN  
 Flow rate : 0.2 mL/min  
 Detector : ESI-MS (SIM-)  
 Column temp. : 30 °C  
 Sample : 50 µg/mL each (in H<sub>2</sub>O/CH<sub>3</sub>CN=1/1), 2 µL

## Environmental Analysis

### Analysis of haloacetic acid

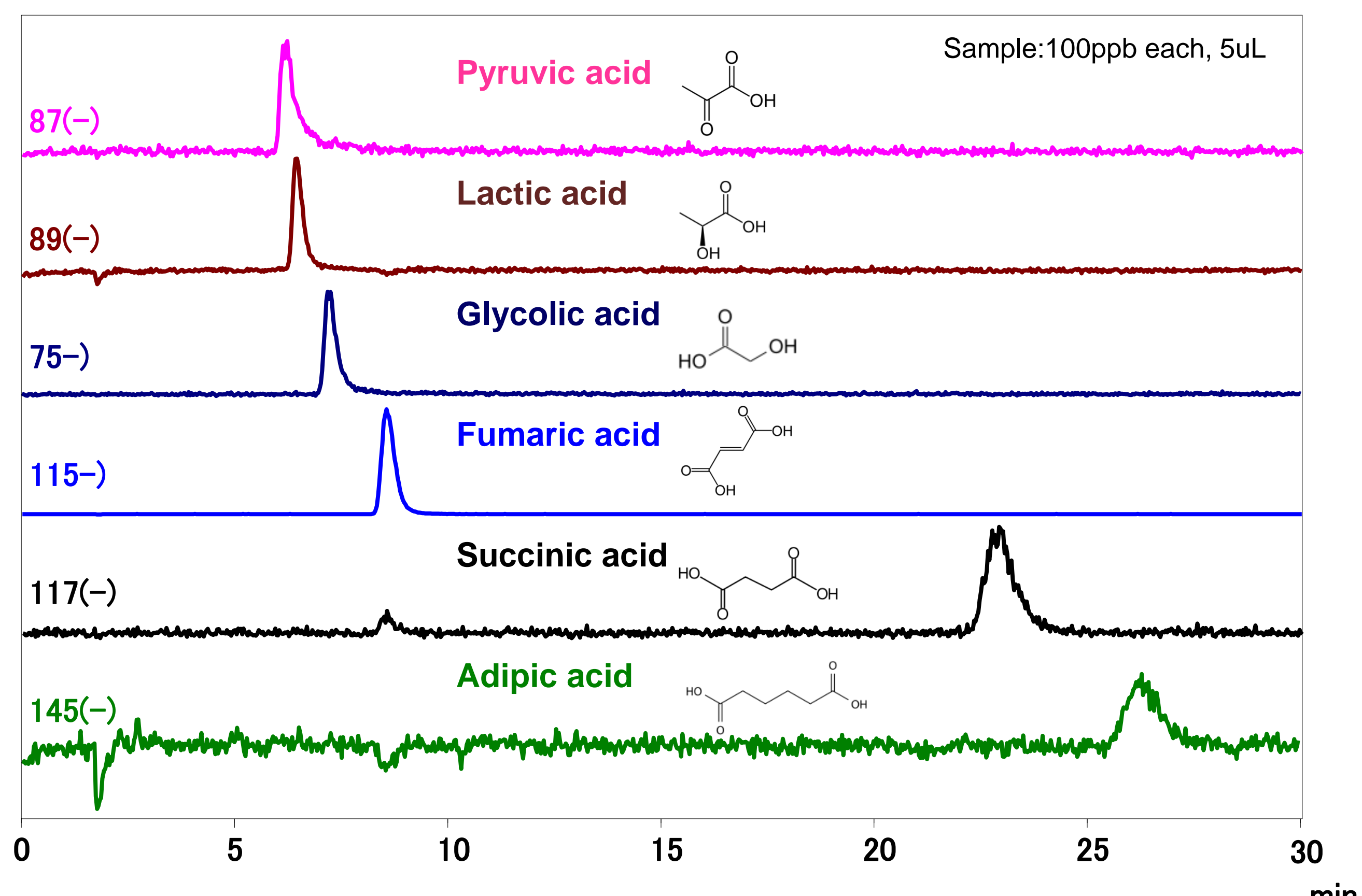


Column : Shodex HILICpak VT-50 2D  
 Eluent : 25 mM CH<sub>3</sub>COONH<sub>4</sub> aq. (pH 9.2)/CH<sub>3</sub>CN=50/50  
 Flow rate : 0.2 mL/min  
 Detector : ESI-MS (SIM-,MRM-)  
 Column temp. : 40 °C

- VT-50 is possible to analyze haloacetic acid lower limit of 2ppb.
- The detection of 2 ng/mL is needed in Japanese official analytical method for tap water.

## Food Analysis

### Analysis of organic acid

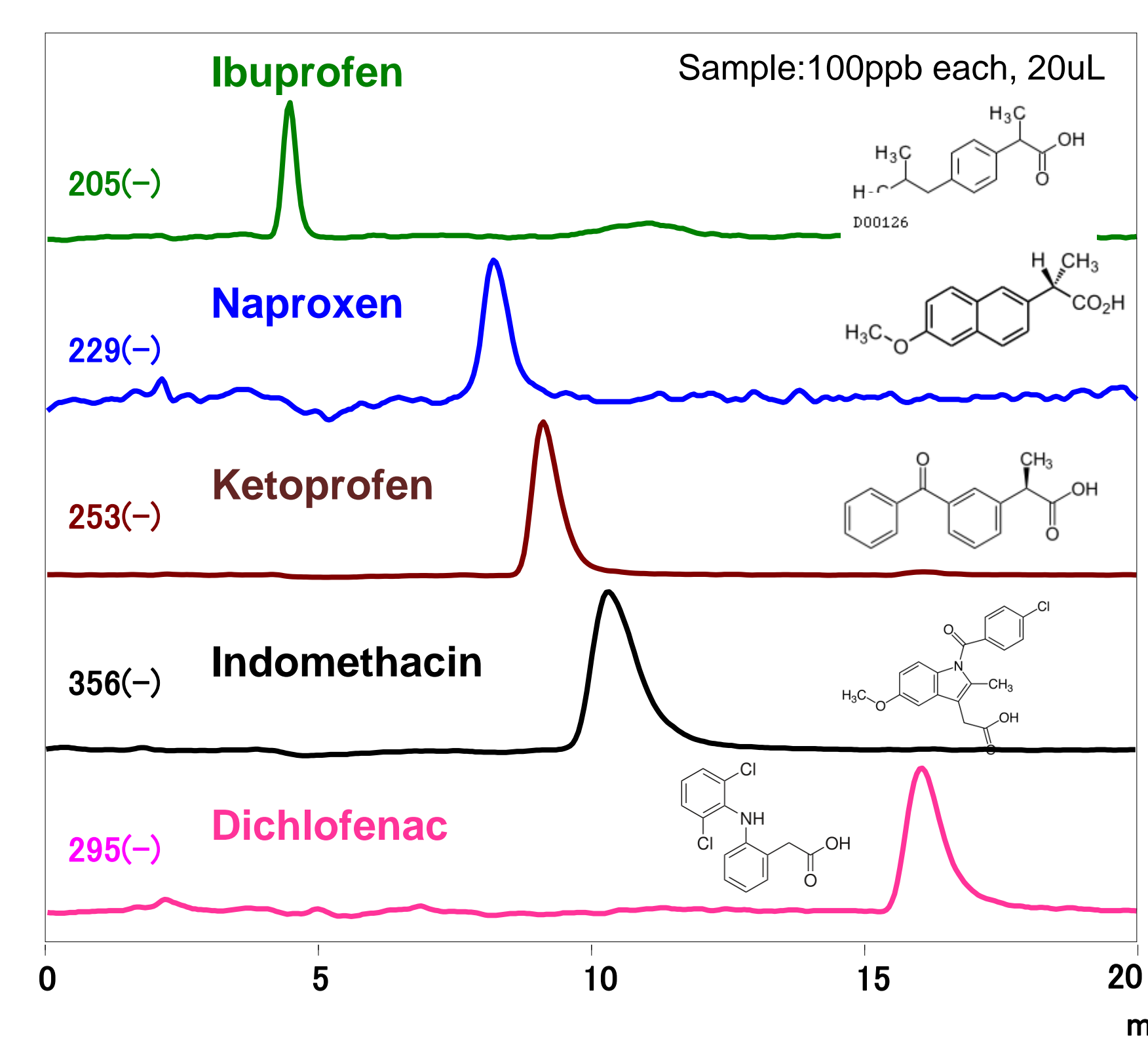


Column : Shodex HILICpak VT-50 2D  
 Eluent : 100 mM HCOONH<sub>4</sub> aq./CH<sub>3</sub>CN=30/70  
 Flow rate : 0.2 mL/min  
 Detector : ESI-MS (SIM-)  
 Column temp. : 30 °C

- Organic acids are usually analyzed with water-rich eluent which is not convenient for LC/MS.
- VT-50 has the advantage of analyzing organic acids by LC/MS because of high concentration of acetonitrile in the eluent.

## Life Science Analysis 1

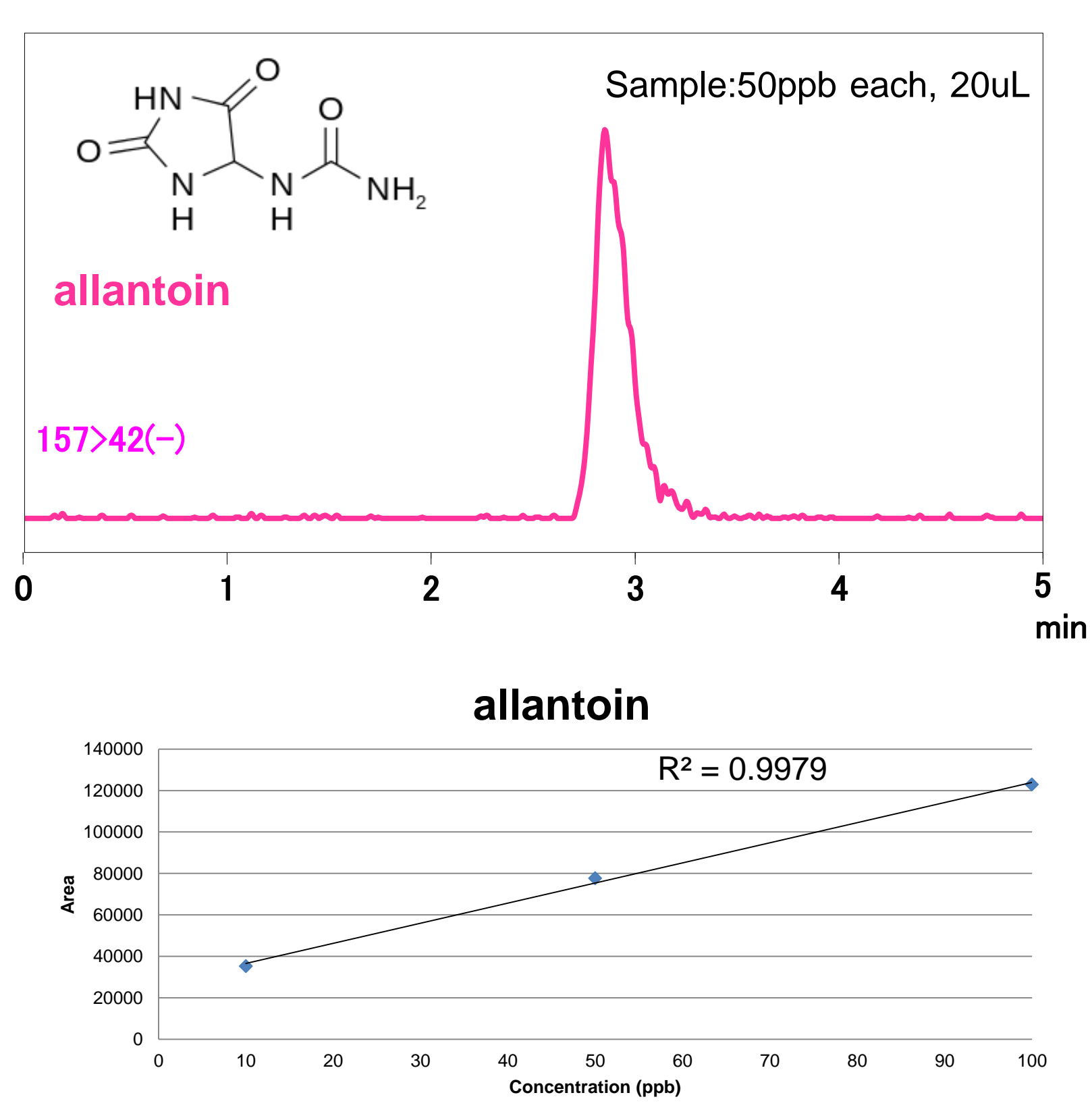
### Analysis of antipyretic analgesics



Column : Shodex HILICpak VT-50 2D  
 Eluent : 50 mM HCOONH<sub>4</sub> aq./CH<sub>3</sub>CN=10/90  
 Flow rate : 0.2 mL/min  
 Detector : ESI-MS (SIM-)  
 Column temp. : 40 °C

- VT-50 is suitable for LC/MS analysis of hydrophilic active ingredients in drugs or cosmetics.
- Examples of antipyretic analgesics and allantoin are shown.

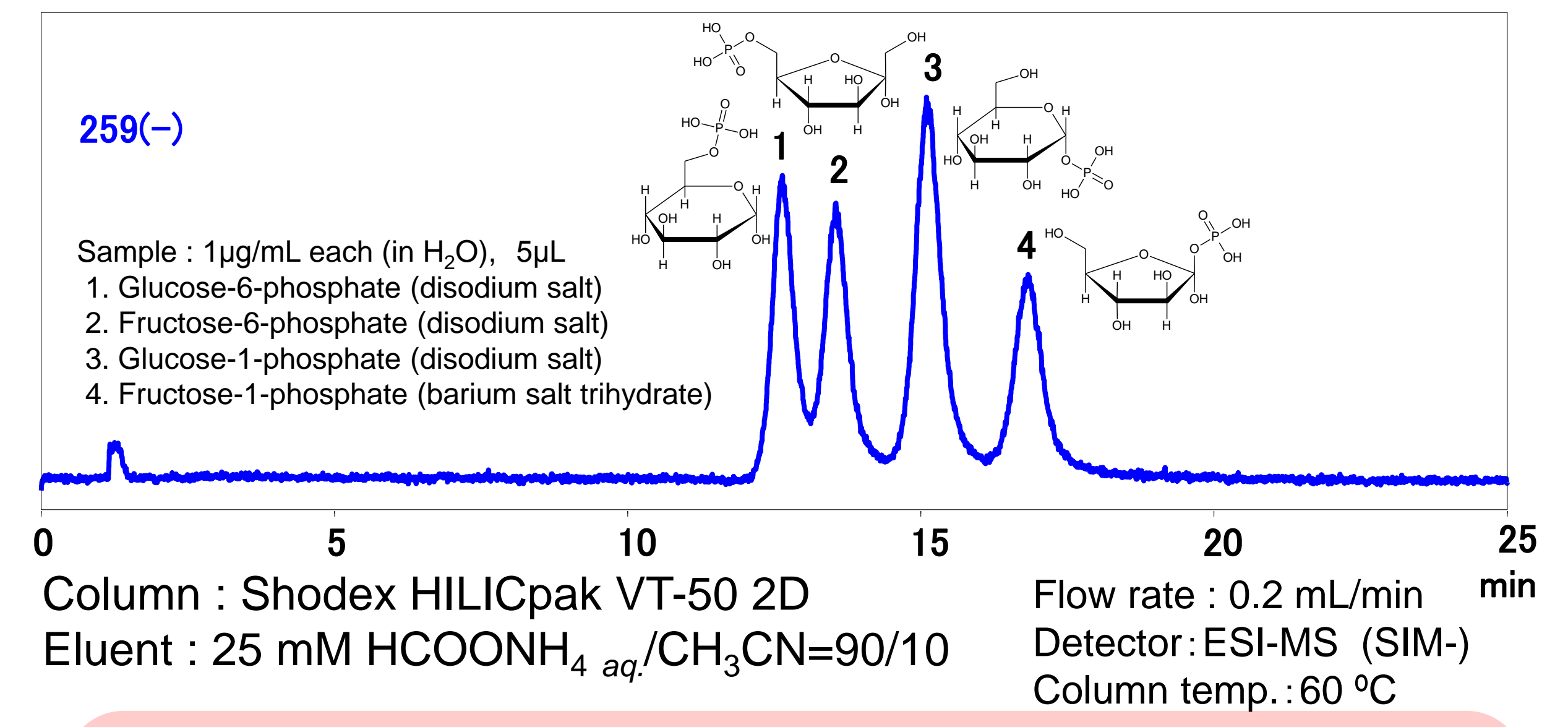
### Analysis of allantoin



Column : Shodex HILICpak VT-50 2D  
 Eluent : 50 mM HCOONH<sub>4</sub> aq./CH<sub>3</sub>CN=25/75  
 Flow rate : 0.2 mL/min  
 Detector : ESI-MS (MRM-)  
 Column temp. : 40 °C

## Life Science Analysis 2

### Analysis of phosphorylated saccharides



- In vivo phosphorylated saccharides are preferably analyzed by LC/MS due to the low concentration.
- Phosphorylated saccharides are also easily adsorbed on SUS column housing.
- VT-50 can be used for LC/MS analysis of phosphorylated saccharides.

## Conclusion

- New HILIC column, Shodex HILICpak VT-50 can be used for many field of analysis with LC/MS detection.
- PEEK housing material allows for the analysis of substances that would normally be adsorbed with SUS housing ( such as phosphorylated saccharides, glyphosate, and antipyretic acids).
- HILICpak VT-50 does not need the derivatization of samples or addition of ion pair reagent to the eluent.