# Fast Analysis of 1,12-dodecyldiphosphonic Acid by HPLC with ELSD

## Application Note

Energy and Chemicals


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### Introduction

1,12-Dodecyldiphosphonic acid, a phosphorous acid, is polar and has surfactant properties. It consists of two polar heads joined by a non-polar, twelve carbon chain.

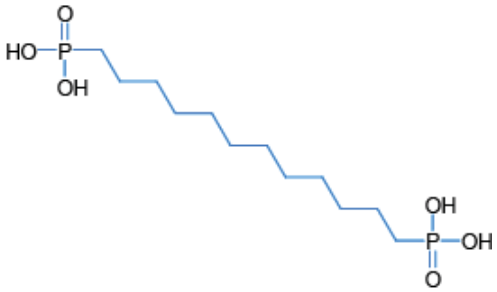


***Figure 1. Structure of 1,12-dodecyldiphosphonic acid.***

This molecule does not have a good chromophore and, therefore, is not suited to UV detection. In addition, the method for elution involves a gradient and that rules out RI detection. However, as the compound is non-volatile, it is ideally suited to the Agilent ELSD. The Agilent ELSD is renowned for its rugged design and ability to deliver high performance for demanding HPLC or GPC applications. PLRP-S 100Å columns are ideally suited to the analysis of low molecular weight compounds because the very small pore sizes have extremely high surface areas available to the solutes. Analysis of 1,12-dodecyldiphosphonic acid demonstrates the high performance of PLRP-S and the Agilent ELSD.


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## Instrumentation

Column: PLRP-S 100Å 5 µm, 150 x 4.6 mm (p/n PL1111-3500)
Detector:Agilent ELSD (neb=60 °C, evap=70 °C, gas=1.0 SLM)

## Materials and Reagents

Eluent A:Water, 2% Acetic acid
Eluent B:Methanol, 2% Acetic acid

## Sample Preparation

1 mg 1,12-dodecyldiphosphonic acid/mL in Water:Methanol, 60:40 (v/v)

## Conditions

Gradient: see Table 1
Flow Rate: 0.8 mL/min
Temperature: 60 °C

***Table 1. Gradient elution of 1,12-dodecyldiphosphonic acid.***

| Time | %A | %B |
|---|---|---|
| 0 | 40 | 60 |
| 2 | 40 | 60 |
| 8 | 100 | 0 |
| 15 | 100 | 0 |
| 20 | 40 | 60 |

## Results and Discussion

Figure 2 shows the good baseline stability achieved with a 20 µg loading of 1,12-dodecyldiphosphonic acid.

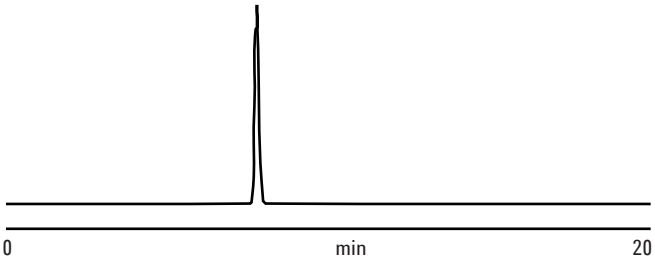


***Figure 2. Loading of 1,12-dodecyldiphosphonic acid at 20 µg.***

The limits of detection are shown in Figure 3.

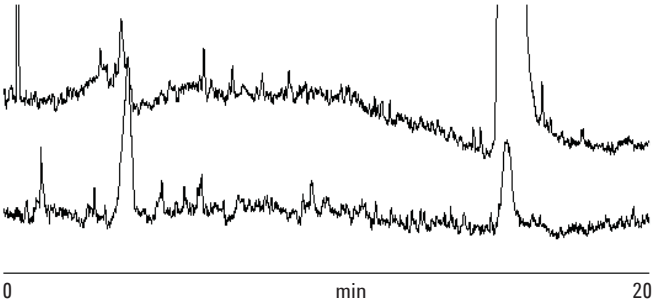


***Figure 3. Limits of detection for 1,12-dodecyldiphosphonic acid.***

## Conclusion

The Agilent ELSD and PLRP-S successfully detected 1,12-dodecyldiphosphonic acid despite its lack of a chromophore.

PLRP-S columns are ideally suited to the analysis of many small molecules. These columns are more retentive for small molecules than the majority of alkyl bonded silicas. PLRP-S media possess a much greater surface area than alkyl bonded silicas and, therefore, even polar molecules, such as carboxylic acids, may be retained much longer, resulting in greater resolution.

The robust design of the Agilent ELSD allows the nebulizer and evaporator to operate at very high temperatures, efficiently handling the high boiling point solvents that other ELSDs simply cannot manage.

PLRP-S columns used with the Agilent ELSD is an ideal combination for these challenging applications.

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