

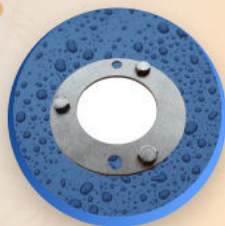


# affinisep

The art of making sample preparation easier

## GLYPHOSATE ANALYSIS

by Solid Phase Extraction  
& Passive Sampling with POCIS



# TABLE OF CONTENTS

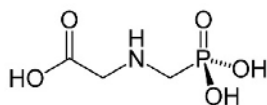
—	<b>Glyphosate analysis</b>	<b>4</b>
—	<b>AFFINIMIP® SPE GLYPHOSATE KITS</b>	<b>5</b>
—	<b>AFFINIMIP® SPE POCIS GLYPHOSATE KITS</b>	<b>6</b>
	<b>Application notes</b>	
	<b>Glyphosate - AMPA and Glufosinate with No derivatization - LC-MS/MS :</b>	
	<b>Food analysis by Sample preparation</b>	
	• in cereals	7
	• in red wine	8
	• in black tea	9
	• in honey	10
	• in beers	11
	• in apple juice	12
	• in cannabis	13
	<b>Water analysis</b>	
	• in sea water	14
	• in mineral water	15
	• in river water	16
—	<b>Glyphosate and AMPA in water - Capillary Electrophoresis analysis</b>	<b>17</b>
—	<b>Glyphosate - AMPA and Glufosinate in several waters - FMOC derivatization - LC-MS/MS</b>	<b>18</b>
—	<b>How to use POCIS?</b>	<b>19</b>
—	<b>Monitoring of glyphosate - AMPA with a passive sampler AFFINIMIP® POCIS Glyphosate</b>	<b>20</b>
—	<b>Analytical conditions for LC-MS/MS analysis</b>	<b>21</b>
—	<b>Publications and posters</b>	<b>22</b>
—	<b>Ordering information</b>	<b>23</b>
—	<b>About AFFINISEP</b>	<b>24</b>

# GLYPHOSATE ANALYSIS

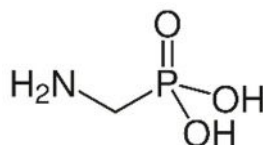
This booklet describes different applications of **AFFINIMIP® SPE Glyphosate** for the analysis of Glyphosate, AMPA and Glufosinate. The determination of very low concentrations of these molecules in various waters as well as in very complex matrices is shown.

In addition, as these molecules can be found in surface and underground water, an application with **AFFINIMIP® POCIS Glyphosate** shows the uptake of these molecules as a POCIS passive sampler.

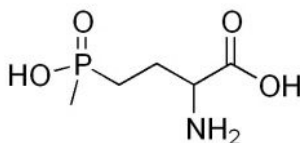
For the analysis of these compounds, several analytical methods have been used such as LC-MS/MS even without derivatization as well as Capillary Electrophoresis –UV.



Glyphosate



AMPA



Glufosinate

## Do you know ?

Glyphosate and Glufosinate are closely related herbicides referred to as phospho-herbicides. Glyphosate undergoes rapid microbial degradation in plants, soil and water to the metabolite aminomethylphosphonic acid (AMPA). Codex alimentarius had defined a MRL (maximum residue limit) for Glyphosate of 0.05mg/Kg in meat or milk and 30mg/Kg in cereals and for Glufosinate, 2mg/Kg of soybean.

# AFFINIMIP® SPE Glyphosate kits

- ✓ Efficient for Glyphosate, AMPA, Glufosinate and others metabolites
- ✓ Ready to use kit
- ✓ Tested with LC-MS/MS, Capillary Electrophoresis - UV
- ✓ Do not require derivatization of these molecules
- ✓ Tested on large volume of water, tea, cereals, honey...
- ✓ Simple & Fast process
- ✓ High capacity cartridges



SPE Cartridge



Detailed protocol of use



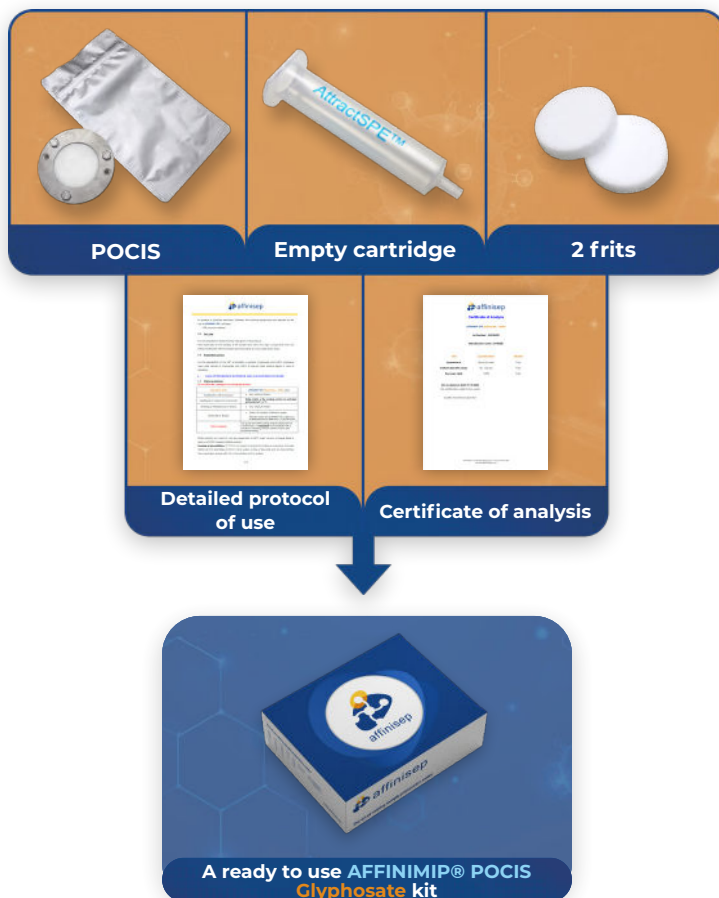
Certificate of analysis



A ready to use AFFINIMIP® SPE  
Glyphosate kit

# AFFINIMIP® POCIS Glyphosate kits

- ✓ Integrative sampling method over several weeks
- ✓ For the monitoring of glyphosate, AMPA and glufosinate
- ✓ Efficient in Sea water/surface water/groundwater
- ✓ Supply of empty columns/frits for the post-exposure extraction
- ✓ Formats available for surface water and groundwater





# GLYPHOSATE, AMPA, GLUFOSINATE IN CEREALS NO DERIVATIZATION – LC-MS/MS



## Protocol of purification

### Sample preparation

Mix 9g of crushed cereals + 75mL ultrapure water with 1% formic acid. Sonicate 30 min, centrifuge 10 min. The supernatant is put to pH = 7 with ammonia solution and filtered to form the loading solution.

Purification with a **6mL AFFINIMIP® SPE Glyphosate** cartridge with improved capacity.

#### CONDITIONING

9 mL ultrapure water

#### LOADING

9 mL of loading solution (~1mL/min)

#### WASHING

24 mL ultrapure water

#### ELUTION

8 mL ultrapure water with HCl 0.1M

#### ANALYSIS

Elutions are evaporated under vacuum at 60°C for 2 hours and dissolved in 1mL of mobile phase containing 0.8mM of EDTA-Na2.

## Results

Recovery of Glyphosate, AMPA and Glufosinate after **AFFINIMIP® SPE Glyphosate** clean-up of Cereals spiked at 92µg/Kg each. No derivatization was performed.

	Glyphosate	AMPA	Glufosinate
Yield (%)	101%	98%	93%
RSD (n=3)	3%	2%	3%

The analysis method is described on [page 21](#)

### Catalog number

- **6mL format with enhanced performances - 50/pk** **FS113-15-03B**
- **12mL format - 50/pk** **FS113-03C**

# GLYPHOSATE, AMPA, GLUFOSINATE IN RED WINE NO DERIVATIZATION – LC-MS/MS



## Protocol of purification

### Sample preparation

10 mL of red wine is diluted with 90 mL of ultrapure water. The pH is adjusted to 6–8 with 35% ammonia solution. The solution is then spiked with glyphosate, AMPA, and glufosinate at 12.5 µg/L each. The following SPE protocol is carried out from conditioning to elution using GX-241 autosampler.

Purification with a **6mL AFFINIMIP® SPE Glyphosate** cartridge with improved capacity.

#### CONDITIONING

9 mL ultrapure water

#### LOADING

24 mL of loading solution at 1.5 mL/min

#### WASHING

1. 8 mL 80% methanol (in water)
2. 4 mL ultrapure water

#### ELUTION

8 mL HCl 0.2M (in water)

#### ANALYSIS

Elutions are collected in polypropylene vials, evaporated under vacuum at 60°C for 2 hours, and dissolved in 3 mL of mobile phase containing 0.8mM of EDTA-Na<sub>2</sub>.

## Results

Recovery of Glyphosate, AMPA and Glufosinate after **AFFINIMIP® SPE Glyphosate** clean-up of red wine spiked at 12.5 µg/L each (diluted wine). No derivatization was performed.

	Glyphosate	AMPA	Glufosinate
Yield (%)	96%	81%	70%

The analysis method is described on [page 21](#)

### Catalog number

- **6mL format with enhanced performances - 50/pk** **FS113-15-03B**
- **12mL format - 50/pk** **FS113-03C**

# GLYPHOSATE, AMPA, GLUFOSINATE IN BLACK TEA NO DERIVATIZATION – LC-MS/MS



## Protocol of purification

### Sample preparation

Mix 3g of black tea powder + 50mL 1% Formic acid in ultrapure water. Sonicate 30 min, centrifuge 10 min. The supernatant is filtered and put to pH = 7 with ammonia solution to form the loading solution.

Purification with a 6mL AFFINIMIP® SPE Glyphosate cartridge.

#### CONDITIONING

6 mL ultrapure water

#### LOADING

3 mL of loading solution (~1mL/min)

#### WASHING

12 mL ultrapure water

#### ELUTION

8 mL ultrapure water with HCl 0.1M

#### ANALYSIS

Elutions are evaporated under vacuum at 60°C for 2 hours and dissolved in 3mL of mobile phase containing 0.8mM of EDTA-Na2.

## Results

Recovery of Glyphosate, AMPA and Glufosinate after AFFINIMIP® SPE Glyphosate clean-up of flavoured Black Tea spiked at 1,67mg/kg each. No derivatization was performed.

	Glyphosate	AMPA	Glufosinate
Yield (%)	103%	81%	100%
RSD (n=3)	10%	12%	6%

The analysis method is described on [page 21](#)

### Catalog number

- 6mL format - 50/pk \_\_\_\_\_ **FS113-03B**
- 12mL format - 50/pk \_\_\_\_\_ **FS113-03C**



# GLYPHOSATE, AMPA, GLUFOSINATE IN HONEY NO DERIVATIZATION – LC-MS/MS



## Protocol of purification

### Sample preparation

Mix 10g of honey + 1% Formic acid in ultrapure water. Agitate for 30 min with a stirring bar. The solution is filtered and put to pH = 7 with ammonia solution to form the loading solution.

Purification with a **6mL AFFINIMIP® SPE Glyphosate** cartridge.

#### CONDITIONING

6 mL ultrapure water

#### LOADING

3 mL of loading solution (~1mL/min)

#### WASHING

12 mL ultrapure water

#### ELUTION

8 mL ultrapure water with HCl 0.1M

#### ANALYSIS

Elutions are evaporated under vacuum at 60°C for 2 hours and dissolved in 3mL of mobile phase containing 0.8mM of EDTA-Na2.

## Results

Recovery of Glyphosate, AMPA and Glufosinate after **AFFINIMIP® SPE Glyphosate** clean-up of Honey spiked at 400 µg/kg each. No derivatization was performed.

	Glyphosate	AMPA	Glufosinate
Yield (%)	104%	89%	100%
RSD (n=3)	4%	8%	8%

The analysis method is described on [page 21](#)

### Catalog number

- **6mL format - 50/pk** \_\_\_\_\_ **FS113-03B**
- **12mL format - 50/pk** \_\_\_\_\_ **FS113-03C**

# GLYPHOSATE, AMPA, GLUFOSINATE IN BEERS NO DERIVATIZATION – LC-MS/MS



## Protocol of purification

### Sample preparation

The beer was firstly degassed by sonication for 30 minutes. Then, 10 mL of beer is diluted with 90 mL of ultrapure water. The pH is adjusted to 6–8 with 35% ammonia solution. The solution is then spiked with glyphosate at 1.56 µg/L and with AMPA and glufosinate at 3.12 µg/L each.

Purification with a **12mL AFFINIMIP® SPE Glyphosate** cartridge with improved capacity.

#### CONDITIONING

9 mL ultrapure water

#### LOADING

16 mL of loading solution at 1.5 mL/min

#### WASHING

1. 8 mL methanol/water (80/20 v/v)
2. 4 mL ultrapure water

#### ELUTION

8 mL HCl 0.2M (in water)

#### ANALYSIS

Elutions are collected in polypropylene vials, evaporated under vacuum at 60°C, and dissolved in 1 mL of mobile phase containing 0.8mM of EDTA-Na2.

## Results

Recovery of Glyphosate, AMPA and Glufosinate after **AFFINIMIP® SPE Glyphosate** clean-up of blond beer (n = 4) and dark beer (n = 3). No derivatization was performed.

	Glyphosate	AMPA	Glufosinate
Yield (%)	102%	59%	79%
RSD (n=7)	5%	8%	9%
Spiked at	15.6µg/L	31.2µg/L	31.2µg/L

The analysis method is described on [page 21](#)

### Catalog number

- **6mL format with enhanced performances - 50/pk** **FS113-15-03B**
- **12mL format - 50/pk** **FS113-03C**

# GLYPHOSATE, AMPA, GLUFOSINATE IN APPLE JUICE NO DERIVATIZATION – LC-MS/MS



## Protocol of purification

### Sample preparation

5 mL of clear apple juice is diluted with 15 mL of ultrapure water. 200µL of formic acid is added and the solution is stirred. The pH is adjusted to 6–8 with 35% ammonia solution. The solution is then spiked with glyphosate, AMPA, and glufosinate at 16.7 µg/L each.

Purification with a 6mL AFFINIMIP® SPE Glyphosate cartridge.

#### CONDITIONING

6 mL ultrapure water

#### LOADING

6 mL of loading solution at 1.5 mL/min

#### WASHING

12 mL ultrapure water

#### ELUTION

8 mL ultrapure water with HCl 0.1M

#### ANALYSIS

Elutions are evaporated under vacuum at 60°C for 2 hours and dissolved in 1mL of mobile phase containing 0.8mM of EDTA-Na<sub>2</sub>.

## Results

Recovery of Glyphosate, AMPA and Glufosinate after AFFINIMIP® SPE Glyphosate clean-up of Apple juice spiked at 67µg/Kg each. No derivatization was performed.

	Glyphosate	AMPA	Glufosinate
Yield (%)	96%	86%	92%

The analysis method is described on [page 21](#)

### Catalog number

- 6mL format - 50/pk \_\_\_\_\_ **FS113-03B**
- 12mL format - 50/pk \_\_\_\_\_ **FS113-03C**

# GLYPHOSATE, AMPA, GLUFOSINATE IN CANNABIS LIKE PLANT NO DERIVATIZATION – LC-MS/MS



## Protocol of purification

### Sample preparation

3g Dried and crushed *Datisca Cannabina* mixed with 60 mL 1% formic acid (in water) were sonicated for 30 min and centrifuged at 4000 RPM for 10 min. The supernatant is neutralized at pH = 7 with ammonia solution. The loading solution is obtained after a 0.45µm filtration.

Purification with a **6mL AFFINIMIP® SPE Glyphosate** cartridge with improved capacity and a **6mL AttractSPE® Pass-Through Glyphosate**.

#### CONDITIONING

9 mL ultrapure water

#### LOADING

6mL loading solution (~1mL/min)

#### WASHING

24mL Water

#### ELUTION (E1)

8 mL HCl 0.1M (in water) collected in polypropylene vials

Pass through Post extraction cartridge

#### EQUILIBRATION

1. 4mL Methanol
2. 4mL Ultrapure water

#### PASS THROUGH OF E1

8 mL of E1 (~2mL/min). Apply a light vacuum at the end to force the solvent out of the cartridge

#### ANALYSIS

Passed through elutions are collected in polypropylene vials, evaporated under vacuum at 60°C for 2 h, and dissolved in 3 mL of mobile phase containing EDTA-Na<sub>2</sub> 0,8mM.

## Results

Recovery of Glyphosate, AMPA and Glufosinate after **AFFINIMIP® SPE Glyphosate** - AMPA clean-up of dried plant spiked at 333µg/Kg each. No derivatization was performed.

	Glyphosate	AMPA	Glufosinate
Yield (%)	70%	72%	81%
RSD (n=3)	5%	7%	6%

The analysis method is described on [page 21](#)

### Catalog number

#### ■ AFFINIMIP® SPE Glyphosate

6mL format with enhanced performances - 50/pk

FS113-15-03B

12mL format - 50/pk

FS113-03C

#### ■ AttractSPE® Pass-Through Glyphosate

6mL – 50/pk

Pass-GLY-50.S.6

# GLYPHOSATE, AMPA, GLUFOSINATE IN SEA WATER NO DERIVATIZATION – LC-MS/MS



## Protocol of purification

### Sample preparation

Water is filtered through 1.2µm membrane filter. 500 mL samples are then spiked at 200 ng/L with each analytes. (One sample not spiked for blank determination). The automated system Gilson 274 ASPEC Large Volume System was used to realize SPE protocol.

Purification with a 6mL AFFINIMIP® SPE Glyphosate cartridge with improved capacity.

#### CONDITIONING

9 mL ultrapure water

#### LOADING

500 mL of loading solution (~4mL/min)

#### WASHING

12 mL ultrapure water

#### ELUTION

2 x 4 mL HCl 0.2M in water

#### ANALYSIS

Elutions are collected in polypropylene vials, evaporated under vacuum at 60°C for 2 hours, and dissolved in 1 mL of mobile phase containing 0.8mM of EDTA-Na2.

Measured pH of sample	8.42*
Measured concentration of salts	37.8 g/L

\*It is recommended to get a pH above 5 to avoid loss of AMPA.

## Results

Recovery of Glyphosate, AMPA and Glufosinate after AFFINIMIP® SPE Glyphosate clean-up of sea water spiked at 200 ng/L. No derivatization was performed.

	Glyphosate	AMPA	Glufosinate
Yield (%)	102%	91%	61%
RSD (n=3)	3%	3%	5%

The analysis method is described on [page 21](#)

### Catalog number

- 6mL format with enhanced performances - 50/pk **FS113-15-03B**
- 12mL format - 50/pk **FS113-03C**



# GLYPHOSATE, AMPA, GLUFOSINATE IN MINERAL WATER NO DERIVATIZATION – LC-MS/MS



## Protocol of purification

### Sample preparation

One liter of mineral water is spiked in a plastic bottle with a solution of Glyphosate, AMPA and Glufosinate at 100 ng/L each.

Purification with a **12mL AFFINIMIP® SPE Glyphosate** cartridge.

#### CONDITIONING

12 mL ultrapure water

#### LOADING

1 L of loading solution in ~150 minutes

#### WASHING

12 mL ultrapure water

#### ELUTION

12mL HCl 0.1M in water

#### ANALYSIS

Elutions are collected in polypropylene vials, evaporated under vacuum at 60°C for 2 hours, and dissolved in 1 mL of mobile phase containing 0.8mM of EDTA-Na2.

#### Characteristic composition of water

pH = 7.2

Ca <sup>2+</sup> 104mg/L	Cl <sup>-</sup> <0.05mg/L
Na <sup>+</sup> 6mg/L	SO <sub>4</sub> <sup>2-</sup> 25mg/L
Mg <sup>2+</sup> 17mg/L	NO <sub>3</sub> <1mg/L
K <sup>+</sup> 1mg/L	

## Results

Recovery of Glyphosate, AMPA and Glufosinate after **AFFINIMIP® SPE Glyphosate** clean-up of mineral water spiked at 100ng/L each. No derivatization was performed.

	Glyphosate	AMPA	Glufosinate
Yield (%)	108%	78%	81%

The analysis method is described on [page 21](#)

#### Catalog number

- 6mL format - 50/pk \_\_\_\_\_ **FS113-03B**
- 12mL format - 50/pk \_\_\_\_\_ **FS113-03C**

# GLYPHOSATE, AMPA, GLUFOSINATE IN RIVER WATER NO DERIVATIZATION – LC-MS/MS



## Protocol of purification

### Sample preparation

For this experiment, 500 mL of river water (Le Cailly river, Le Houlme) was spiked with very low concentration of each analyte for trace analysis of the solution.

Purification with a **6mL AFFINIMIP® SPE Glyphosate** cartridge with improved capacity.

#### CONDITIONING

9 mL ultrapure water

#### LOADING

500 mL of loading solution (~4mL/min)

#### WASHING

12 mL ultrapure water

#### ELUTION

2 x 4 mL HCl 0.2M in water

#### ANALYSIS

Elutions are collected in polypropylene vials, evaporated under vacuum at 60°C for 2 hours, and dissolved in 1 mL of mobile phase containing 0.8mM of EDTA-Na2.

Measured pH of sample

~6.5\*

\*It is recommended to get a pH above 5 to avoid loss of AMPA.

## Results

The analytes were simultaneously analyzed by LC-MS/MS. A blank matrix was also performed. The results obtained are presented in the table below. The analytical method is described at the end of the application note.

	Glyphosate	AMPA	Glufosinate
Yield (%)	105%	80%	91%
RSD (n=3)	12%	4%	10%

The analysis method is described on [page 21](#)

### Catalog number

- 6mL format with enhanced performances - 50/pk **FS113-15-03B**
- 12mL format - 50/pk **FS113-03C**

# GLYPHOSATE AND AMPA IN WATER CAPILLARY ELECTROPHORESIS ANALYSIS



## Data extracted from publication:

Preliminary recovery study of a commercial molecularly imprinted polymer for the extraction of glyphosate and AMPA in different environmental waters using MS, B. Claude, C. Berho, S. Bayouhd, L. Amalric, E. Coisy, R. Nehmé, P. Morin, Environ Sci Pollut Res, 24: 12293 (2017).

## Protocol of purification

Purification with a **3mL AFFINIMIP® SPE Glyphosate** cartridge.

### CONDITIONING

6mL ultrapure Water

### LOADING

3 to 500 mL (~1-4mL/min)

### WASHING

3mL Water

### ELUTION

8 mL HCl 0.1M (in water)

## Results

Recovery yields of glyphosate and AMPA after **AFFINIMIP® SPE Glyphosate** clean-up of mineral water spiked at 25µg/mL. Loading volume 3mL. Analysis done by CE without derivatization.

	Glyphosate	AMPA
Yield (%)	85	87

## Method of analysis : Capillary electrophoresis analysis (no derivatization)

- **Column:** fused-silica capillary of 60.2 cm (effective length, 50 cm) x 50 µm ID at 25°C
- **Mobile phase:** 7.5 mM phthalic acid - 51.3 mM histidine running buffer (pH 6.5, ionic strength of 21.8 mM, buffer capacity 25 mM L-1 pH-1) containing 1 mM CTAB
- **Voltage:** +25kV
- **Detection:** UV-DAD (240nm)

## Catalog number

- **3mL format – 50/pk** \_\_\_\_\_ **FS113-03.IP**
- **6mL format – 50/pk** \_\_\_\_\_ **FS113-03B**

# GLYPHOSATE AND AMPA IN SEVERAL WATERS Fmoc DERIVATIZATION - LC-MS/MS



## Data extracted from publication:

Preliminary recovery study of a commercial molecularly imprinted polymer for the extraction of glyphosate and AMPA in different environmental waters using MS, B. Claude, C. Berho, S. Bayouhdh, L. Amalric, E. Coisy, R. Nehmé, P. Morin, Environ Sci Pollut Res, 24: 12293 (2017).

Performance of **AFFINIMIP® SPE Glyphosate** are not affected by physico chemical properties of water (up to 1L loaded).

	Ca	Na	Mg	K	HCO <sub>3</sub>	Cl	NO <sub>3</sub>	SO <sub>4</sub>	Fe	pH
Groundwater	15,7	11,3	4,9	1,3	76	9,7	<0,5	1,2	7,5	7,1
Groundwater	22,3	105,7	17	4,7	136	159	8,9	15,8	0,17	6,4
Groundwater	104,1	13,9	6,9	1,8	203	28,1	113,7	33		7,1
Geothermal water	799	5163,5	189,5	71,9		9759,7		702,2	3,2	
Mineral water	80	6,5	24	1	360	3,8	3,7	12,6		7,2

## Same SPE protocol than page 17

### Method UPLC – MS/MS

- **Column:** UPLC HSS T3 (2.1mm x 100mm, 1,8µm)
- **Mobile phase:** A: Ammonium Acetate 5mM (in water) B: Acetonitrile
- **Flow rate:** 0.2mL/min
- **MS detection:** m/z 321 (ESI-)
- **Injection volume:** 20µL.

## Results

Above five waters spiked at various concentrations with AMPA and Glyphosate.

	Glyphosate	AMPA
Concentration	100 to 750ng/L	
Average Yield (%)	>70%	>75%

Time (min)	A %	B %
0	90	10
2	90	10
7	50	50
7,5	0	100
11	0	100

### Catalog number

3mL format - 50/pk

**FS113-03.IP**

6mL format - 50/pk

**FS113-03B**

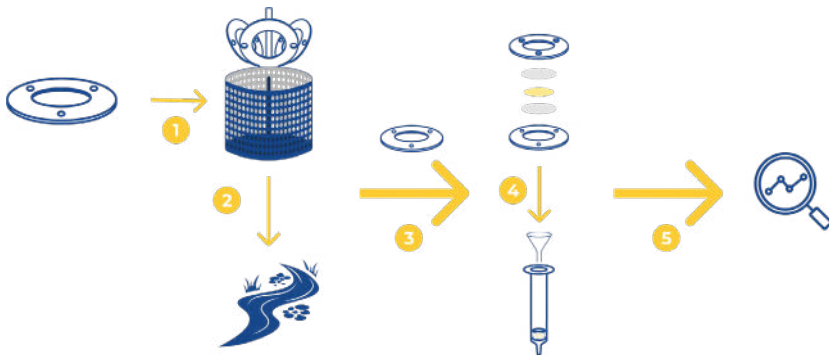
# HOW TO USE POCIS?

Polar Organic Chemical Integrative Sampler (POCIS) are very common and useful passive samplers for monitoring polar organic chemicals in several aquatic environments such as freshwater, groundwater, seawater, etc...

This Integrative sampling method can adsorb an extensive range of contaminants such as pharmaceuticals and personal care products (PPCPs), pesticides including glyphosate, endocrine disruptors, fragrances, fire retardants, perfluorinated compounds, plasticizers, and their degradation products depending on the choice of the POCIS.

**This sampler consists of a solid powder sorbent between two filtration membranes.**

- 1 POCIS is mounted on a holder inside a canister to protect from any floating object.**
- 2 During the exposure period, the organic pollutants pass through the membranes and accumulate on the sorbent integratively for one or more weeks.**
- 3 The POCIS is then washed and sent to the laboratory to extract the sorbent.**
- 4 AFFINISEP provides empty cartridges and frits for powder transfer.**
- 5 Once the sorbent is in the SPE column, contaminants can be eluted prior to an analysis by chromatography.**



Several formats are available to adapt sampling to field constraints. The most popular product is the round POCIS (90mm diameter). However, two other narrow formats (5 cm width) are also available for groundwater monitoring.





# MONITORING OF GLYPHOSATE - AMPA WITH A PASSIVE SAMPLER

## AFFINIMIP® POCIS Glyphosate



### Data extracted from publication:

Laboratory calibration of a POCIS-like sampler based on molecularly imprinted polymers for glyphosate and AMPA sampling in water, C. Berho, B. Claude, E. Coisy, A. Togola, S. Bayouhdh, P. Morin, L. Amalric, Anal Bioanal Chem 409: 2029 (2017).



### Passive Sampling with POCIS

Polar Organic Chemical Integrative Sampler (POCIS) is a passive sampler designed to provide the time weighted average (TWA) concentration of chemicals during a sampling period of several weeks.

**AFFINIMIP®POCIS Glyphosate** enables the sampling of Glyphosate and AMPA in water (Groundwater, geothermal, mineral...).

Then the sorbent is collected in an empty SPE column for the extraction of Glyphosate and AMPA.

### Experimental conditions:

Mineral water (pH = 7) fortified at 500ng/L of AMPA and glyphosate. Concentrations kept constant during whole experiment.

Pesticides concentration in the tank, temperature, TOC and conductivity monitored during the experimental period to verify the stability of physico-chemical conditions in water.

### EXTRACTION OF THE ANALYTE FROM AFFINIMIP®POCIS GLYPHOSATE

2 x 4mL HCl 0,1M (in water)

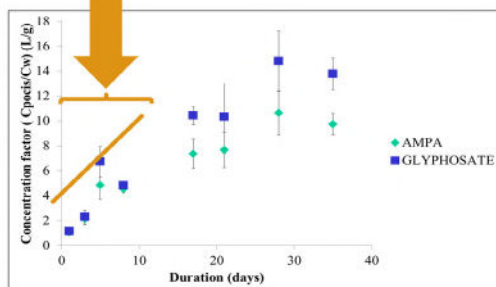
### ANALYSIS

The extraction solution is then evaporated and reconstituted with water prior to analysis

## Results

Laboratory sampling rates estimation for AMPA and glyphosate using the **AFFINIMIP® POCIS Glyphosate**.

**Sampling rates: 130mL/day/200mg**  
**AFFINIMIP® POCIS Glyphosate in agreement with other pesticides in classical POCIS.**



### Catalog number

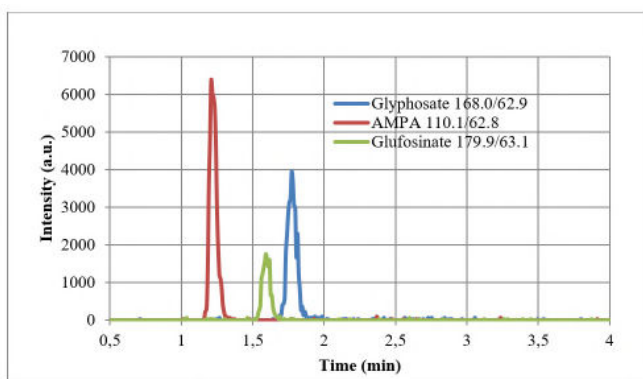
• **AFFINIMIP® POCIS Glyphosate – 10/pk** **POCIS-GLY.90.55.A.10**

# ANALYTICAL CONDITIONS FOR LC-MS/MS ANALYSIS

LC-MS/MS conditions of Analysis of non derivatized Glyphosate, AMPA, Glufosinate in various matrices after purification with **AFFINIMIP® SPE Glyphosate**.

LC Conditions			MS/MS Conditions				
LC Dionex U3000			Sciex Qtrap 4000 ESI- MS/MS				
Column : Acclaim Trinity Q1 100 mm x 3 mm ID (3 µm) + prefilter			Curtain gas: 30				
Injection volume : 20µL			CAD: High				
T° sampler : 10°C			IS: -4500V				
Flow rate : 0.5mL/min			Temperature: 700°C				
			GS1/GS2: 50/50				
Time (min)	Solvent A	Solvent B	Analyte	Retention time (min)	Q1	Q3	CE (V)
0	100%	0%	Glyphosate	1.8	168.0	62.9	-32
3	100%	0%			168.0	78.9	-50
3.2	0%	100%	AMPA	1.2	110.1	62.8	-24
6	0%	100%			110.1	78.8	-34
6.2	100%	0%	Glufosinate	1.6	179.9	63.1	-58
10.2	100%	0%			179.9	95.0	-24
<b>Solvent A</b> : 50mM Ammonium formate, pH 2.9 (adjusted with formic acid) <b>Solvent B</b> : Acetonitrile							

LC-MS/MS conditions for tested analytes.



Typical LC-MS/MS chromatogram obtained for the three main ion transitions of glyphosate, AMPA, and glufosinate from a sample purified using **AFFINIMIP® SPE Glyphosate**.

## AFFINIMIP® SPE glyphosate

[The challenge of detecting the herbicide glyphosate and its metabolite AMPA in seawater – Method development and application in the Baltic Sea](#); Marisa A. Wirth, Detlef E. Schulz-Bull, Marion Kanwischer, *Chemosphere* **262**, 128327 (2021)



[Preliminary recovery study of a commercial molecularly imprinted polymer for the extraction of glyphosate and AMPA in different environmental waters using MS](#), B. Claude, C. Berho, S. Bayoudh, L. Amalric, E. Coisy, R. Nehmé, P. Morin, *Environ Sci Pollut Res* **24**, 12293 (2017)

[Method of Glyphosate, AMPA, and Glufosinate Ammonium Determination in Beebread by Liquid Chromatography—Tandem Mass Spectrometry after Molecularly Imprinted Solid-Phase Extraction](#). Małysiak, M.; Kiljanek, T. *Molecules* **27**, 5741 (2022). **Open access**



## AFFINIMIP® POCIS glyphosate

[Estimating 42 pesticide sampling rates by POCIS and POCIS-MIP samplers for groundwater monitoring: a pilot-scale calibration](#), C. Berho, S. Robert, C. Coureau, E. Coisy, A. Berrehouc, L. Amalric, A. Bruchet, *Environ Sci Pollut Res* **27**, 18565–18576 (2020)



[Laboratory calibration of a POCIS-like sampler based on molecularly imprinted polymers for glyphosate and AMPA sampling in water](#), C. Berho, B. Claude, E. Coisy, A. Togola, S. Bayoudh, P. Morin, L. Amalric, *Anal Bioanal Chem* **409**, 2029 (2017)

[New molecularly imprinted polymers \(MIP\) used as SPE clean up method and as a passive sampler receiving phase for the catchment of glyphosate and AMPA in water](#), C. Berho, B. Claude, L. Amalric, A. Togola, E. Grellet, S. Bayoudh, K. Puzio, P. Morin with a financial support of the French National Research Agency (ANR): *ECOTECH ORIGAMI PROJECT*, Poster presented at SETAC 2015. **Open access**



[Chronic exposure to glyphosate in Florida manatee](#); Maite De María, Cecilia Silva-Sanchez, Kevin J. Kroll, Michael T. Walsh, Mohammad-Zaman Nouri, Margaret E. Hunter, Monica Ross, Tonya M. Clauss, Nancy D. Denslow, *Environment International* **152**, 106493 (2021). **Open access**

[Detection and accumulation of environmentally-relevant glyphosate concentrations delivered via pulse- or continuous-delivery on passive samplers](#). Ashley A. Coble, Cecilia Silva-Sanchez, William J. Arthurs, Camille A. Flinders, *Science of the Total Environment* **838**, 156131, (2022). **Open access**



## AFFINIMIP® SPE- Product list

Designation	Definition	Reference	Nber of units
<b>AFFINIMIP® SPE</b> Glyphosate	3mL Selective SPE cartridges for glyphosate, AMPA & Glufosinate	FS113-03.1P	50
	6mL Selective SPE cartridges for glyphosate, AMPA & Glufosinate	FS113-03B	50
	6mL Selective SPE cartridges for glyphosate, AMPA & Glufosinate – Enhanced performances	FS113-15-03B	50
	12mL Selective SPE cartridges for glyphosate, AMPA & Glufosinate	FS113-03C	50
<b>AFFINIMIP® POCIS</b> Glyphosate	POCIS for the uptake of glyphosate, AMPA & Glufosinate	POCIS-GLY.90.55.A.10	10
		POCIS-GLY.90.55.A.50	50

## SPE ACCESSORIES – Product list

SPE Accessories	Designation	Definition	Reference
<b>Manifold</b>	SPE Vacuum Manifold	12-port model	ACC-MAN2
<b>SPE Adapter &amp; Reservoir kit</b>	SPE Adapter & Reservoir kit	Kit of 12 reservoirs 60ml and adapters for use with 1,3 & 6 mL cartridges	ACC-AR1
<b>Mini PUMP</b>	Mini vacuum pump	Diaphragm vacuum mini pump	ACC-PUMP
<b>Vacuum pump trap</b>	SPE Vacuum pump trap kit	1L trap kit	ACC-TRAP

## How to place an order?



[www.affinisep.com](http://www.affinisep.com)



[contact@affinisep.com](mailto:contact@affinisep.com)



# affinisep

## ABOUT AFFINISEP

Affinisep develops and manufactures in France (Normandy) various kits for passive sampling and sample preparation dedicated to the development of analytical applications in various fields such as water monitoring, food safety and quality control, proteomics, metabolomics and genomics.



### Brands

AFFINIMIP®  
AttractSPE®  
SilactSPE  
BioSPE™

### Applications

Sample Preparation  
Passive Sampling  
Solid Phase Extraction  
Filtration  
Microextraction

### Matrices

Food, Feed, Soil,  
Oil, Water,  
Biological fluids,  
Proteolytic digest

[www.affinisep.com](http://www.affinisep.com)