Application Note AN-RS-023

# Trace Detection of Aspartame in Beverages

## Protecting consumer safety with Misa

Aspartame is an artificial sweetener touted as a diet-conscious alternative to sugar in beverage and food products. Some studies suggest that consumption of aspartame is correlated with increased risk for brain and hematopoietic cancers, however, the majority of studies find aspartame to be a safe food additive. Consequently, the US and EU approve aspartame as a multi-purpose sweetener with an acceptable daily intake of 40 mg/kg body weight/day. However, the clear health hazard to individuals suffering from phenlyketonuria and ongoing criticism by health food advocates continues to fuel the challenge against aspartame's widespread use in the food industry.

Using Misa (Metrohm Instant SERS Analyzer), beverage products are screened for aspartame levels with no sample preparation beyond simple dilution of a consumer product.

## INTRODUCTION

Misa is a versatile analytical tool for detecting additives in food products. This application note describes a facile method for the rapid and sensitive detection of aspartame in carbonated water and diet cola.

## REFERENCE SPECTRUM AND LIBRARY CREATION

To establish a reference spectrum for aspartame, a pure standard dissolved in water at a concentration of 1 mg/g is analyzed using gold nanoparticles (Au NPs). The unique baseline-corrected spectrum shown in **Figure 1** can be used to create a library entry for aspartame.

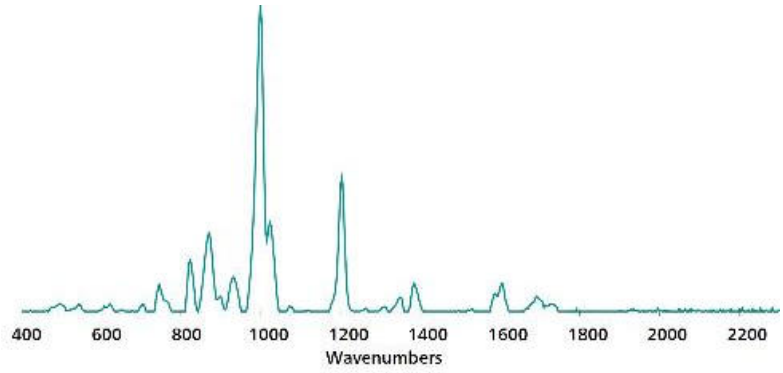


**Figure 1.** Standard SERS Au NP reference spectrum for aspartame in water.

## EXPERIMENT

A stock solution of aspartame in water was used to spike carbonated water from a local grocer to create a concentration range of samples: 100, 50, 10, 5, and 1 µg/mL, and 100 ng/mL. For testing purposes, 100 µL of each sample was pipetted into a glass vial containing 800 µL of Au NPs and 100 µL of 0.5 mol/L NaCl. The contents were shaken to mix, and the vial was placed into the Misa vial attachment for spectral acquisition. Diet cola from the same vendor was subjected to a 10x dilution (1:9 cola:water) and analyzed using the same procedure. Dilution reduces spectral contribution from other ingredients in the cola matrix.

**Table 1.** Experimental parameters

| Instrument | | Acquisition | |
|---|---|---|---|
| Firmware | 0.9.33 | Laser Power | 5 |
| Software | Misa Cal V1.0.15 | Int. Time | 1 s |
| Misa Vial Attachment | 6.07505.040 | Averages | 10 |
| ID Kit - Au NP | 6.07506.440 | Raster | ON |

## RESULTS

Overlaid baseline-corrected SERS spectra acquired for carbonated water spiked with varying concentrations of aspartame shows detection down to 100 ng/mL (Figure 2).

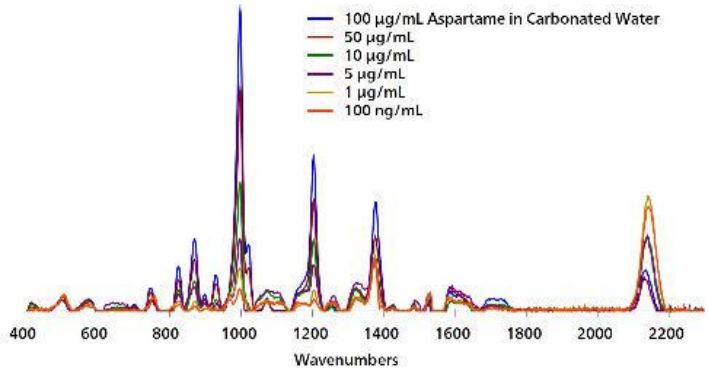


**Figure 2.** SERS Au NP concentration range for aspartame in carbonated water.

SERS analysis of 10x diluted diet cola with minimal processing provides high resolution detection estimated between 10–50 µg/mL, which is consistent with typical concentrations of aspartame used to sweeten diet cola (e.g., 350 µg/mL).

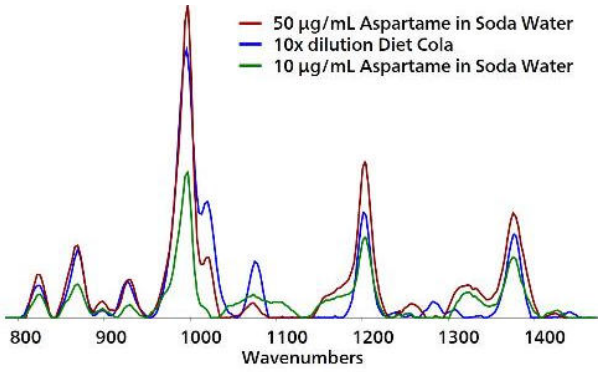


**Figure 3.** Detection of aspartame in 10x diluted diet cola.

## FIELD TEST PROTOCOL

### Detection of aspartame in the field

Using a pipette, add 1 drop of diet soda to a clean vial. Add 9 drops DI water to soda in vial, cap, and shake to mix. Fill a *clean vial* halfway full with Au NPs. Using pipettes, add 2 drops each of sample solution and NaCl solution to Au NPs, then cap and shake the vial gently to mix. Insert into vial attachment on Misa for measurement.

**Table 2.** Requirements for field test protocol

| | |
|---|---|
| ID Kit - Au NP | 6.07506.440 |
| includes: | Gold nanoparticles (Au NP) |
| | Scoop |
| | Disposable pipettes |
| | 2 mL glass vials |
| Reagents | |
| DI water | |
| NaCl solution | 3 g NaCl in 100 mL water |
| Test settings | Use **ID Kit OP** on MISA |

## CONCLUSION

The rapid and sensitive detection of aspartame in beverages is demonstrated using Misa and Au NPs. This assay demonstrates a quick and easy, costeffective and portable solution for detection of food additives in low-resource testing environments.

## CONTACT

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## CONFIGURATION


### MISA Advanced

Metrohm Instant SERS Analyzer (MISA) 是一款高性能、便携式分析系,可快速/定非法物、食品添加和微量食品染物。MISA 的特点是配了 Metrohm 独特的道光栅描 (ORS) 技的高效光。其空需求最小和并且池寿命有所延,是或移室用的理想。MISA 提供各 1 激光附件,可活取。分析可通 BlueTooth 或 USB 接行。MISA Advanced 套件是一个完整套件,其作用是用能用 Metrohms 米粒溶液和 P-SERS 条行 SERS 分析。MISA Advanced 套件包含了一个 MISA 小管附件、一个 P-SERS-附件、一个 ASTM 校正准件、一个 USB 迷、一个 USB 供元和用于行 MISA 器的 MISA Cal 件。随供了一个用来安全保管器和附件的固保箱。


### ID – Au NP

ID 套件 - Au NP 包含了 Mira/Misa 用使用体金溶液行 SERS 分析所需的件。套件包含了一个一次性抹刀、一个移液管、品小瓶和一个含金体的瓶子。