

# Application Data Sheet

## No. 10

### GCMS

Gas Chromatograph Mass Spectrometer

## Analysis of Least Volatile Compounds through Direct Sample Introduction

Direct sample introduction (DI) is a method of directly introducing a sample to an ion source without passing it through a gas chromatograph (GC).

DI is an effective method for mass spectral measurements of synthesized materials. The Shimadzu GC-MS can use direct sample introduction without having to remove the column.

This application datasheet introduces the results of measurements of vitamin C and reserpine, which are usually difficult to analyze with a GC.

### Instrument

Fig. 1 shows the probe used for direct sample introduction, while Fig. 2 illustrates the principle involved. The sample dissolved in the solvent is injected into the glass sample cup which is set at the tip of the probe. The solvent is dried, and then the probe is inserted into the mass spectrometer's ion box. The sample cup is heated, and the sample is introduced to the ion source box, where it is ionized by the electrons discharged from the filament.



Fig. 1: Direct Sample Introduction Probe (Bottom Left) and Insertion of the Probe into the MS Unit

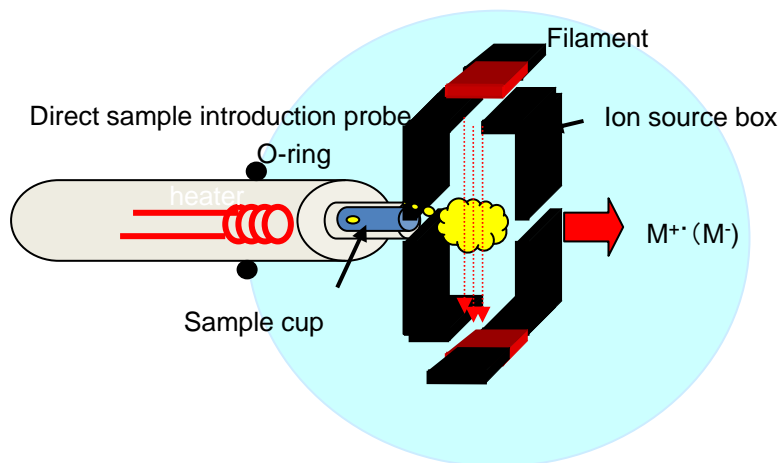


Fig. 2: Principle Behind Direct Sample Introduction

### Analysis Conditions

Table 1: Analysis Conditions

GC-MS : GCMS-QP2010 Series

[GC]

Injection mode : Direct Sample Introduction

DI temperature : Room temperature -> (80°C/ min) -> 500°C (10 min)

[MS]

Ion source temperature : 250°C

Ion source temperature : 1 to 5 min

Measurement mode : Scan

Mass range : m/z 60-700

Event time : 0.5 sec

## Results

Fig. 3 shows the mass spectrum and structural formula for reserpine. While reserpine is not suited for analysis by a gas chromatograph because of its molecular weight of 608.68 and its nitrogen content, a mass spectrum can easily be obtained using the DI method.

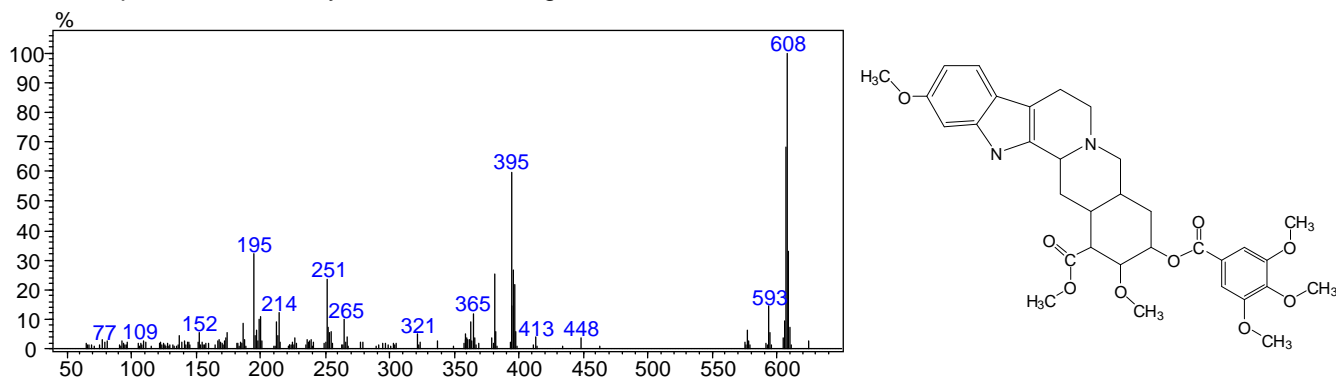


Fig. 3: Mass Spectrum and Structural Formula for Reserpine

Fig. 4 shows the mass spectrum and structural formula for vitamin C. Because vitamin C is a water-soluble vitamin and has 4 hydroxyl groups, it is highly polarized and is not suited for analysis by a gas chromatograph. However, the mass spectrum can easily be obtained utilizing the DI method.

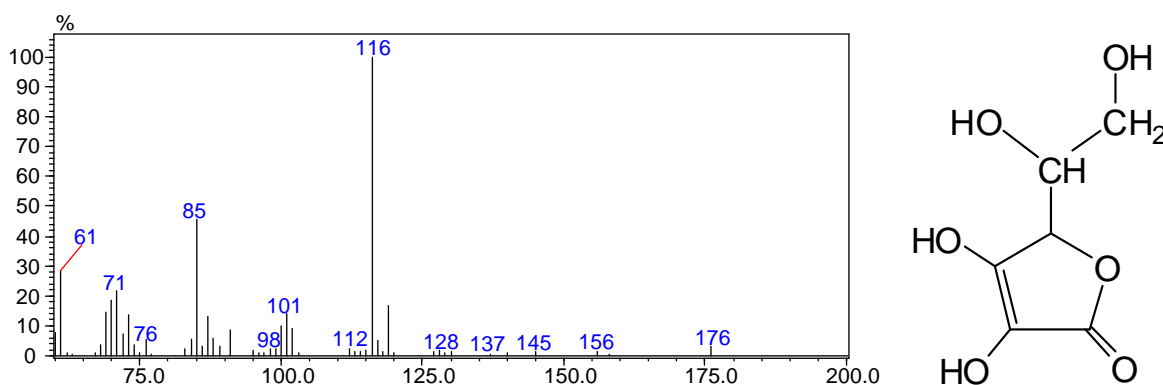


Fig. 4: Mass Spectrum and Structural Formula for Vitamin C

## Summary

The direct sample introduction method (DI) enables the mass spectra of least volatile compounds to be obtained quickly and easily.

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