AccuTOF™

Introduction of Dual ESI and Corona ESI Ion Sources

We have developed two new ion sources, the Dual ESI and Corona ESI, for the AccuTOF LC-TOF MS system that was introduced in the spring of 2002. The Dual ESI (Figure 1) provides two ESI (electrospray ionization) sprayers. This permits the introduction of a reference compound without disturbing or suppressing the spray of the analyte. In addition, the dual-probe system can be useful for high-throughput analysis.

The Corona ESI ion source (Figure 2) is equipped with both an ESI sprayer and a corona-discharge electrode. The combination of ESI and APCI (atmospheric pressure chemical ionization) in a single source is useful for rapid analysis of unknown elements, and for improved efficiency in determining optimal analysis conditions. In addition, the orthogonal spray ion sources feature long-term stability and easy maintenance. For further details about the orthogonal-spray API source, refer to applications note MS-021024B.

Figure1. Dual ESI Ion Source

Figure 2. Corona ESI Ion Source

Exact Mass Measurement Using Dual ESI Ion Source

Exact mass measurement using two sprayers is one of the benefits of the Dual ESI Ion Source. We conducted an exact mass measurement of rhodamine as a test sample, which was introduced from the main sprayer. Reserpine was introduced from the secondary sprayer as standard reference (drift correction or "lock mass") for mass calibration.

Table 1 shows the ion source conditions. Measurement was conducted under three different conditions, by switching on and off the nebulizing gas. Condition 1 is used for the measurement of rhodamine by ionization using the main sprayer. Condition 2 is used for the measurement of reserpine (the drift-correction standard) by the secondary sprayer, and condition 3 is used for obtaining spectra of both, by using two sprayers simultaneously.

The results are shown in Figure 3. The measured value of rhodamine by using reserpine as a drift correction was 443.2323, and the deviation from the theoretical value was 1.13 millimass unit.

	Main Sprayer On	2° Sprayer On	Both On
Main needle potential	2000 V	2000 V	2000 V
Nebulizing gas 1	ON	OFF	ON
2° needle potential	2000 V	2000 V	2000 V
Nebulizing gas 2	OFF	ON	ON

Table 1.

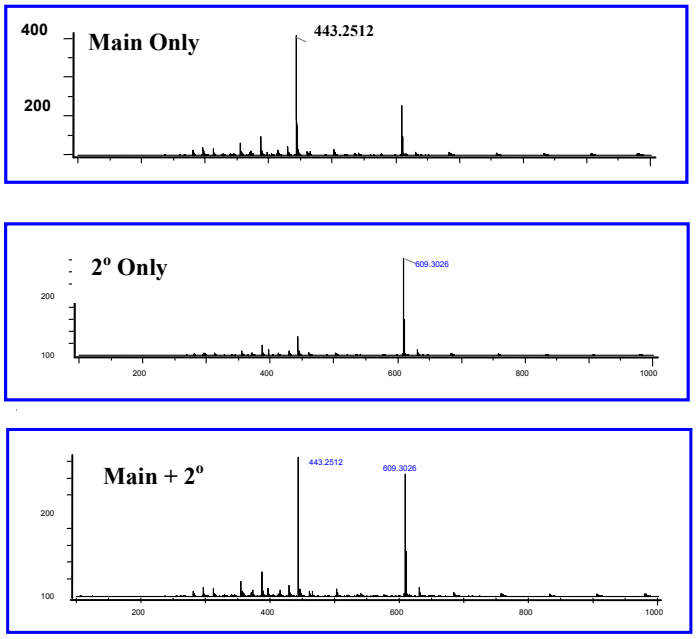

Figure 3. Rhodamine + Reserpine

Measured Value(m/z)	443.2323
Theoretical Value(m/z)	443.2335
Difference	-1.13 mmu
	-2.55 ppm

Table 2. Accurate mass measurement result

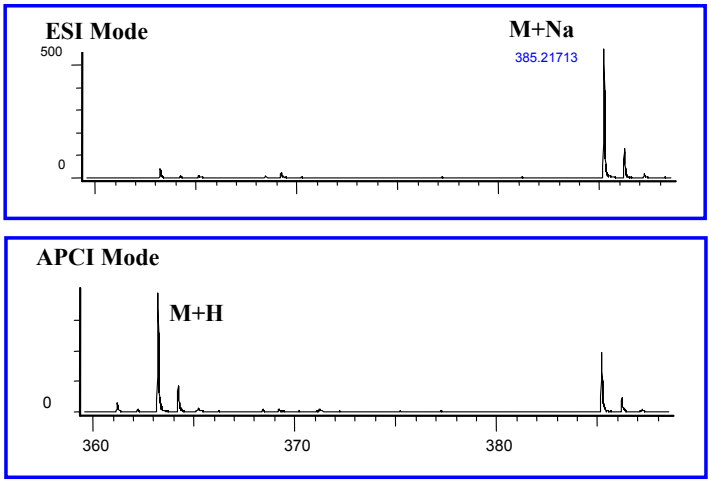

Figure 4. ESI Spectra and APCI Spectra of Hydrocortisone by ESI

Ion Source Condition (ESI Mode)	
Needle Voltage	2000V
Corona Electrode	0V
Orifice Voltage	80V
Ring Lens	10V
Ion Source Condition (APCI Mode)	
Needle Voltage	0V
Corona Electrode	5000V
Orifice 1 Voltage	80V
Ring Lens Voltage	10V
Sample Introduction Condition	
Introduction Method	Infusion
Flow Rate	0.2mL/min

Table 3. Measurement condition of hydrocortisone

Measurement Using Corona ESI Ion Source

Hydrocortisone is measured by using the Corona ESI Ion Source. Table 3 shows the measurement condition and Figure 4 shows the measured spectra. The sodium adduct is observed in ESI mode, and a proton adduct is observed in APCI mode as shown above.

Summary

As mentioned above, the newly-developed Dual ESI ion source provides an easier exact mass measurement with excellent mass accuracy. In addition, the Corona ESI enables acquisition of information of ESI and APCI with a single ion source, and is therefore an extremely useful tool for rapid analysis of unknowns and for efficient optimization of analysis conditions.