SHIMADZU APPLICATION NEWS
LAAN-A-LM-E008
● LIQUID CHROMATOGRAPHY MASS SPECTROMETRY
No.C50

Analysis Using Dual Ion Source DUIS-2010 (Part 1)

Up to now, various ionization methods have been developed for LC-MS analysis. However, from the viewpoint of applicable range of compounds, sensitivity, stability, quantitative capability, ease of operation and maintenance, the methods most used in recent years have been electrospray ionization (ESI), atmospheric pressure chemical ionization (APCI) and atmospheric pressure photoionization (APPI). Selection of the ionization method is one of the important factors to achieving the analysis objective. Although an informed guess might allow selection of the most suitable ionization method based on a knowledge of the physical and chemical properties of the analyte compound, this selection approach would be difficult in the case of compounds having complex structures. When various types of compounds must be measured in a short time, the selection process has significant time implications. This Application News introduces an analysis example using the dual ion source DUIS-2010, which improves efficiency by allowing use of both ESI and APCI.

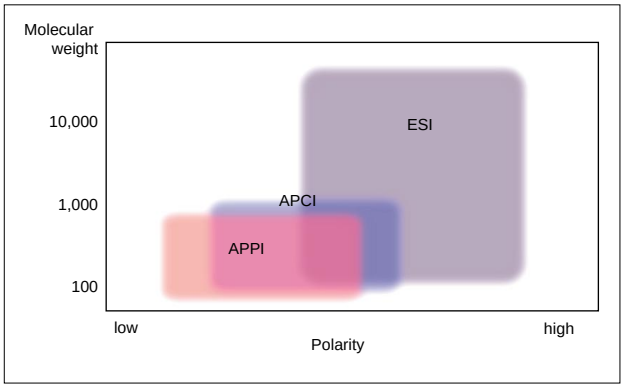

Fig.1 Selection of Ionization Method

■ Polarity of Compounds

As shown in Fig.1, the polarity and molecular weight of the analyte compound are generally considered to be important criteria when selecting the ionization method. Molecular weight is clear, but with respect to polarity, it is often difficult to present a clear indicator, and such guidelines as medium-to-high polarity indicates ESI, low-to-medium polarity indicates APCI, and low polarity indicates APPI are just not adequate. However, it is understood that a considerable number of compounds are analytes that can be appropriately ionized by ESI and APCI.

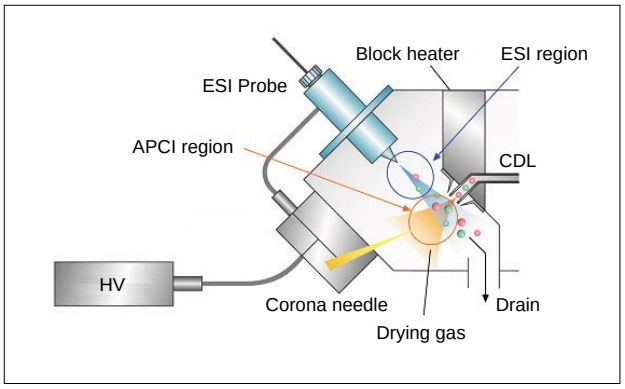

Fig.2 Dual Ion Source

■ Dual Ion Source DUIS-2010

The schematic diagram of the dual ion source is shown in Fig.2. The Dual Ion Source DUIS-2010 is a combination of an ESI and APCI interface. Both the ions generated by the ESI probe and those generated by the electrical discharge of the corona needle pass through the CDL to be introduced into the mass spectrometer.

■ Analysis using the Dual Ion Source DUIS-2010

Here we introduce an analysis example using the Dual Ion Source DUIS-2010. For the analytes, we prepared a sample solution consisting of streptomycin (200 µg/mL) acetophenone (400 µg/mL), and butyl paraben (200 µg/mL), as high-polarity, low-polarity and medium compounds, respectively. The chromatograms obtained from analysis using the dual ion source, ESI only, and APCI only are shown in Fig.3. When the protonated molecule (m/z 582) was monitored, it was detected when using ESI and the dual ion source. Acetophenone was detected using the dual ion source and APCI. The deprotonated butyl paraben molecule (m/z 193) could be detected using all of the ionization methods. Fig.4 shows the mass spectra. It can be observed that streptomycin produces MH^+, $[M+2H+CH_3OH]^{2+}$ and $[M+H+CH_3OH]^+$ using ESI and the dual ion source, but decomposition occurred with APCI.

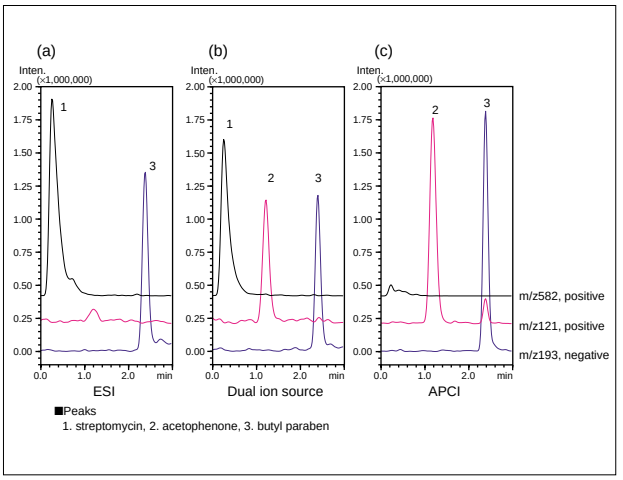

Fig.3 Mass chromatograms of test compounds

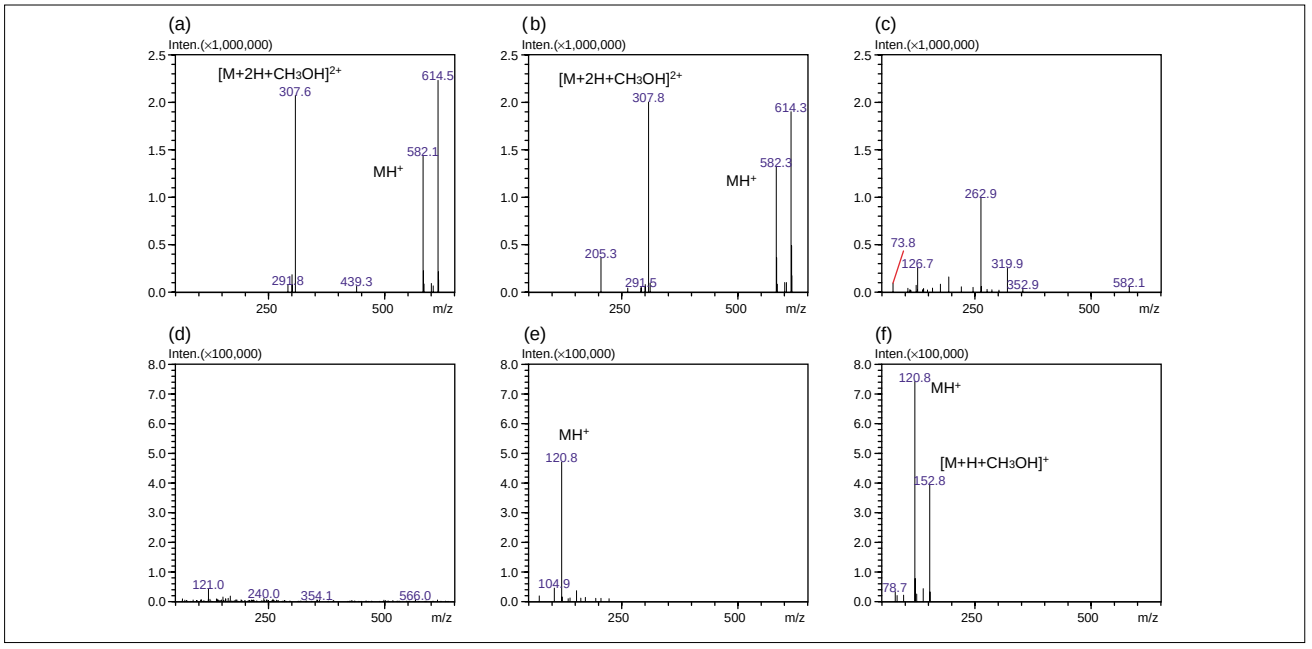

Fig.4 Mass spectra of Test Compounds ((a) : streptomycin-ESI, (b) : streptomycin-DUIS, (c) : streptomycin-APCI, (d) : acetophenone-ESI, (e) : acetophenone-DUIS, (f) : acetophenone-APCI)

Table 1 Analytical Conditions

Column	: Phenomenex Mercury MS C8 (10 mmL. × 4.0 mmI.D., 5 µm)	Probe voltage	: +4.5 kV (DUIS-Positive, ESI-Positive, APCI-Positive), -3.5 kV (DUIS-Negative, ESI-Negative, APCI-Negative)
Mobile phase	: A; water	Nebulizing gas flow	: 1.5 L/min (DUIS, ESI), 2.5 L/min (APCI)
	: B; methanol	Drying gas pressure	: 0.2 MPa (DUIS, ESI)
Time program	: B Conc. 35 % (0 min)→95 % (1 min)	Probe temperature	: 400 ˚C (APCI)
	→95 % (3 min)→35 % (3.01 min)	CDL temperature	: 250 ˚C (DUIS), 250 ˚C (ESI), 300 ˚C (APCI)
	→STOP (5 min)	Block heater temperature	: 300 ˚C (DUIS), 200 ˚C (ESI), 300 ˚C (APCI)
Flow rate	: 0.5 mL/min	CDL, Q-array voltages	: using default values
Column temperature	: room temperature	Scan range	: m/z 50-650 (0.5 sec)
Injection volume	: 2 µL		

NOTES:
✻This Application News has been produced and edited using information that was available when the data was acquired for each article. This Application News is subject to revision without prior notice.

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