

Applications of Desorption Corona Beam Ionization-Mass Spectrometry

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Introduction

Numerous ambient ionization mass spectrometric techniques have been developed for high throughput analysis of various compounds with minimum sample pretreatment.⁽¹⁾ Desorption corona beam ionization (DCBI) is a more recent technique.⁽²⁾ In DCBI, helium is used as discharge gas and heating of the gas is required for sample

desorption. A visible thin corona beam is formed by using hollow needle/ring electrode structure. This feature facilitates localizing sampling areas and obtaining good reproducibility of data. Details of DCBI hardware are shown in Figs. 1 and 2. In this study, DCBI was applied for analysis of various samples.

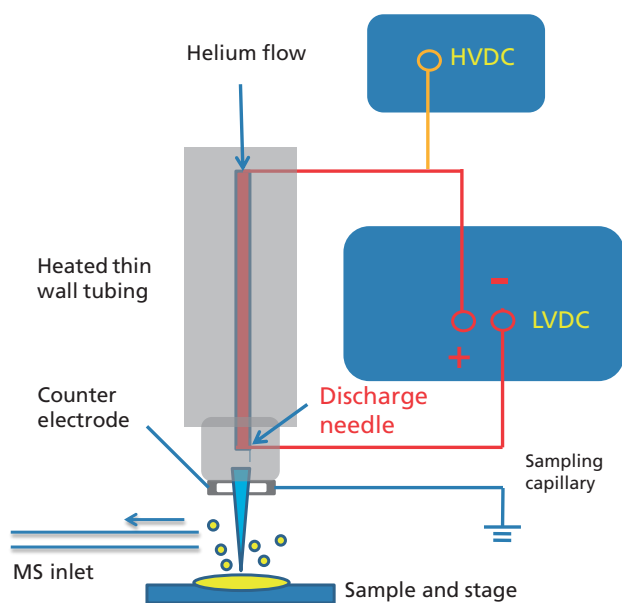


Figure 1 Schematic diagram of DCBI

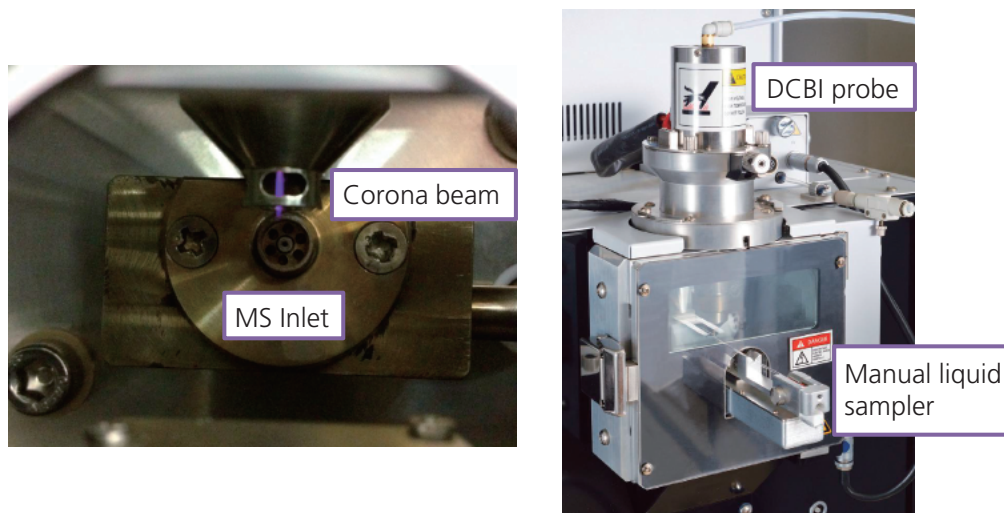


Figure 2 DCBI interface

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Method

Sample Preparation

Samples (melamine, saturated hydrocarbon mixture, polyaromatic hydrocarbon mixture, testosterone, pirimicarb, and methomyl) were dissolved in methanol or acetonitrile.

DCBI-MS Analysis

Samples were analyzed using a DCBI system coupled to a LCMS-2020 quadrupole mass spectrometer (Shimadzu Corporation, Japan). The system was operated with the DCBI control software and LabSolutions for LCMS version 5.42.

Analytical Conditions

DCBI

Flow rate	: 0.6 L/min
HV discharge	: +2.0-3.0 kV
He gas temperature	: 350 °C
Sample volume	: 1, or 2 µL

MS (LCMS-2020 quadrupole mass spectrometer)

Polarity	: Positive
DL temperature	: 250 °C
BH temperature	: 400 °C
Mass range	: <i>m/z</i> 100-500

Results and Discussion

In this experiment, all compounds with variety of polarity from non- to high-polar gave protonated molecules (Figs. 3-8). Methomyl gave also fragment ions (*m/z* 106) by

cleavage at methylcarbonyl group, while fragment ions with significant intensity were not observed for other compounds. Analysis time was less than 1 minute.

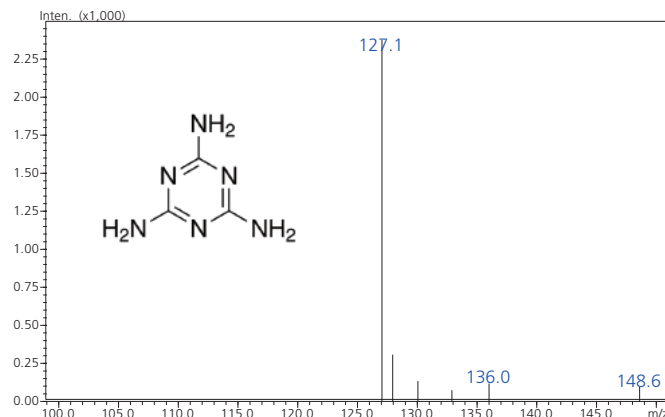
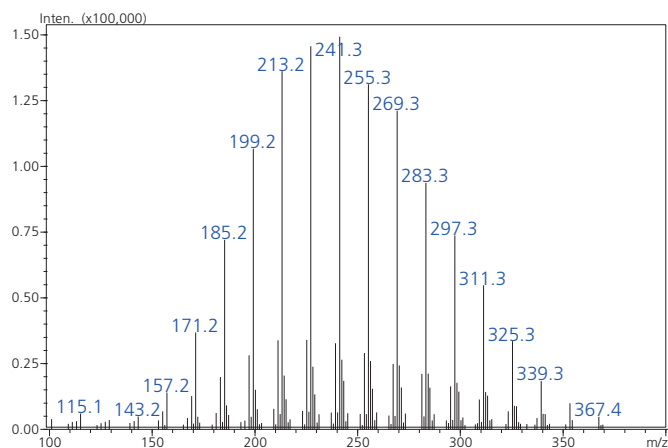


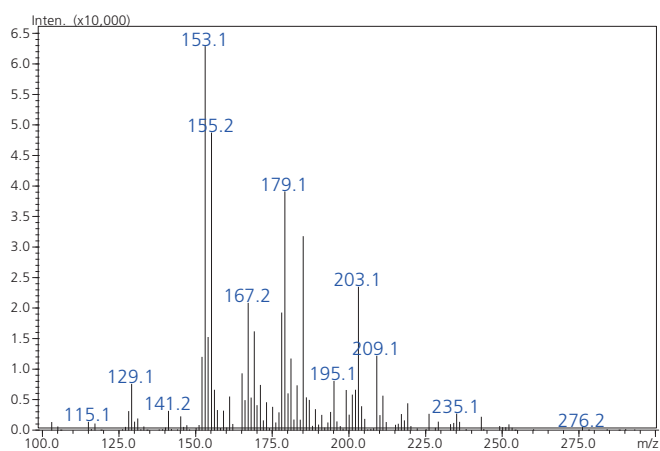
Figure 3 Mass spectrum of melamine (0.5 mg/mL)

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Compound	MW
C ₁₀ H ₂₂	142
C ₁₁ H ₂₄	156
C ₁₂ H ₂₆	170
C ₁₃ H ₂₈	184
C ₁₄ H ₃₀	198
C ₁₅ H ₃₂	212
C ₁₆ H ₃₄	226
C ₁₇ H ₃₆	240
C ₁₈ H ₃₈	254
C ₁₉ H ₄₀	268
C ₂₀ H ₄₂	282
C ₂₁ H ₄₄	296
C ₂₂ H ₄₆	310
C ₂₃ H ₄₈	324
C ₂₄ H ₅₀	338
C ₂₅ H ₅₂	352

Figure 4 Mass spectrum of saturated hydrocarbon mixture (1 mg/mL)



Compound	MW
Naphthalene	128
Acenaphthylene	152
Acenaphthene	154
Fluorene	166
Anthracene	178
Phenanthrene	178
Pyrene	202
Fluoranthene	202
Chrysene	228
Benzo[a]anthracene	228

Figure 5 Mass spectrum of polyaromatic hydrocarbon mixture (2 mg/mL)

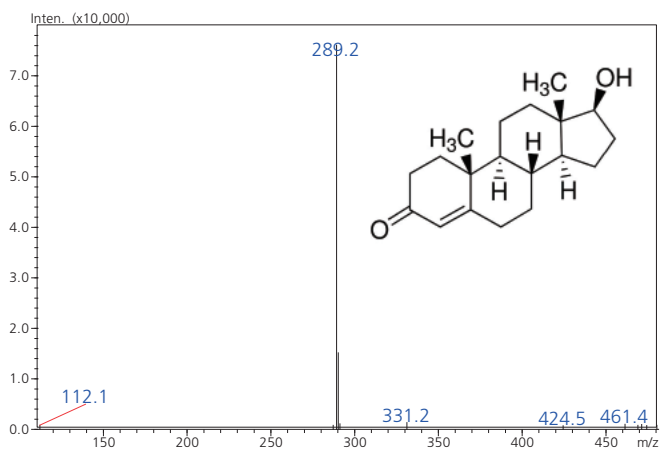


Figure 6 Mass spectrum of testosterone (1 mg/mL)

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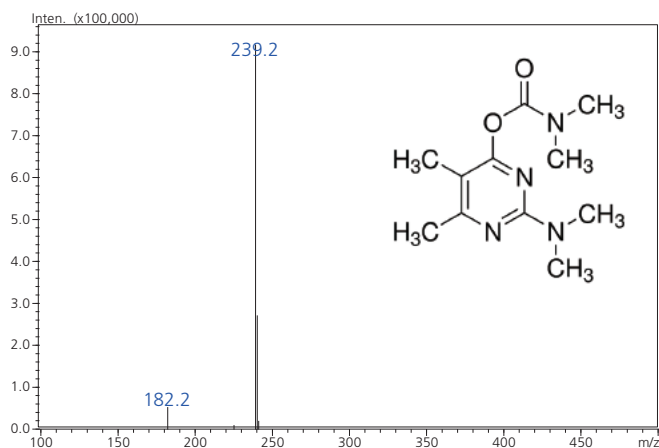


Figure 7 Mass spectrum of pirimicarb (0.5 mg/mL)

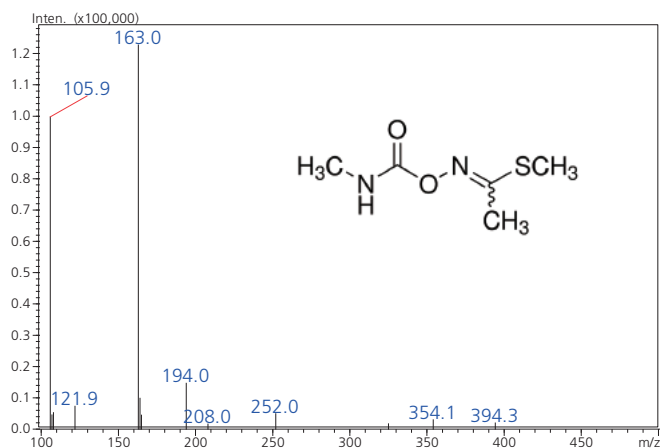


Figure 8 Mass spectrum of methomyl (0.5 mg/mL)

Conclusion

The DCBI system was successfully applied for analysis of samples with various polarity. Mass spectra were quickly obtained after sample introduction to the DCBI probe. The method is useful for fast identification of various compounds.

References

- (1) Monge ME et al, Chem. Rev. 113 (2013), 2269-2308
- (2) Hua W et al, Analyst 135 (2010), 688-695