JMS-T2000GC AccuTOF™ GC-Alpha
Sensitivity in nitrogen carrier gas ③ - CI ion source

Related products: Mass spectrometer (MS)

Introduction

Due to the global shortage of helium gas supply, the demand for alternative gas for GC-MS carrier gas is increasing. Nitrogen gas is the most suitable gas due to its availability and high safety, but it is known that the influence of nitrogen ions generated by the MS ion source causes a decrease in sensitivity. So we have checked the influences of nitrogen carrier gas on JMS-T2000 GC AccuTOF ™ GC-Alpha, and report on MS Tips No. 374-376. This report shows the results of the CI (Chemical Ionization) ion source.

Measurement

Table 1 shows the details of the measurement conditions in this experiment. In the positive ion CI (CI+) method, 1 µL of benzophenone 100 pg / µL was injected. In the negative CI (CI-) method, 1 µL of OFN (octafluoronaphthalene) 10 pg / µL were injected. Helium and nitrogen were used as carrier gases, and the S/N sensitivity and mass accuracy (error) of molecular ions were compared. The carrier gas flow rate was set to 1.0 mL / min in helium and 0.6 mL / min in nitrogen based on the optimum linear velocity of each carrier gas.

Table 1. Measurement conditions

GC : 8890GC (Agilent Technologies, Inc.)		TOFMS : JMS-T2000GC AccuTOF™ GC-Alpha	
Injection volume	1 µL	Ion source	CI ion source
Mode	Splitless	Ionization	①CI+, ②CI-
Column	DB-5MS UI	CI reaction gas	Methane
	(Agilent Technologies, Inc.)	Ionization energy	200eV (300µA)
	30m x 0.25mm, 0.25µm	(filament current)	
Oven temperature	50°C(1min)-40°C/min	Mass Range	*m/z* 100-500
	-250°C(2min)	Detector voltage	2500V
Carrier flow	He : 1.0 mL/min		
	N_2 : 0.6 mL/min		

Results ① CI+ method

Figure 1 shows the extracted ion chromatograms (*m/z* 183.08 ± 0.02) of the measurement result of benzophenone in the CI+ method. The sensitivity was decreased to about 1/2 in nitrogen. Since nitrogen is difficult to ionize in the CI method, which is soft ionization, the decrease in sensitivity was suppressed.

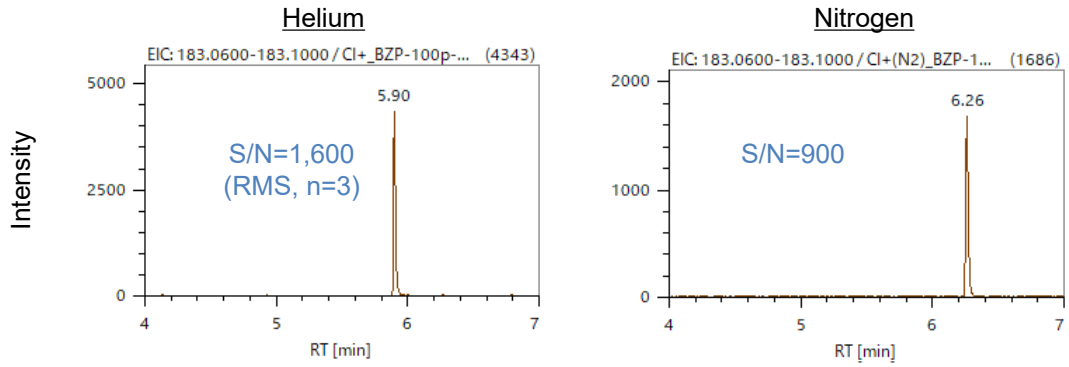

Figure 1. EICs of benzophenone（CI+ method)

Figure 2 shows the mass spectra of the benzophenone measurement result in the CI+ method. Protonated ions $[M+H]^+$ (*m/z* 183.0804) were strongly observed, and their mass errors were as good as 1 mDa or less in both results.

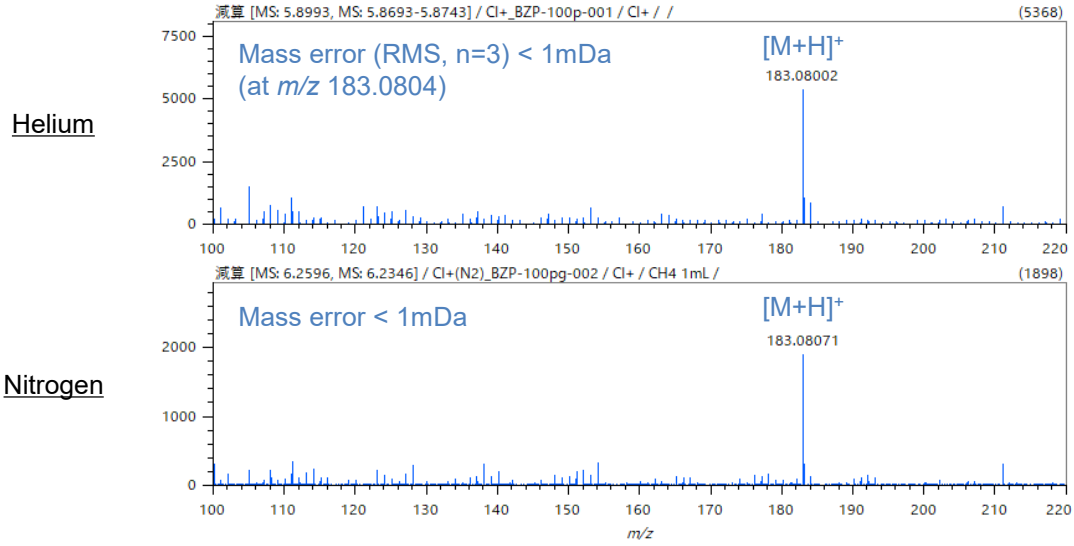

Figure 2. Mass spectra of benzophenone（CI+ method)

Results ②CI- method

Figure 3 shows the extracted ion chromatograms (*m/z* 271.99 ± 0.02) of the OFN measurement result in the CI- method. The sensitivity was improved about twice in nitrogen. Since it was difficult to ionize reaction gas impurity in addition to nitrogen in CI- method, which is soft ionization, it is considered that the sensitivity was improved.

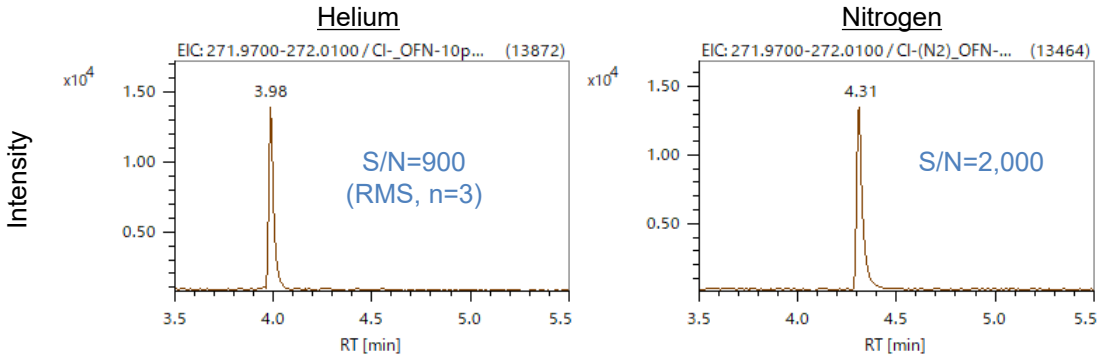

Figure 3. EICs of OFN（CI- method)

Figure 4 shows the mass spectra of the OFN measurement result in the CI- method. The mass errors of the molecular ions $M^{-\cdot}$ (*m/z* 271.9878) were as good as 1 mDa or less in both results.

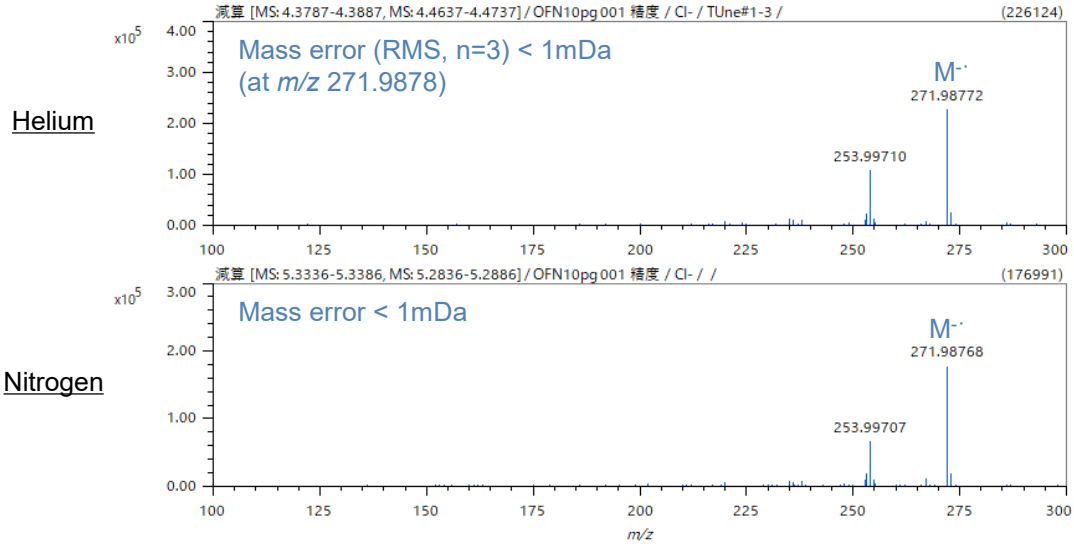

Figure 4. Mass spectra of OFN（CI- method)

Conclusion

The influences of nitrogen carriers on the CI ion source of JMS-T2000GC AccuTOF ™ GC-Alpha were checked. In the CI+ method, the sensitivity was decreased to about 1/2. In the CI- method, the sensitivity was not decreased. The mass errors of the molecular ions were as good as 1 mDa or less in both CI+ method and CI- method.

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