



AccuTOF-GCx Series

Introduction of latest GC/HR-TOFMS system: JMS-T200GC AccuTOF GCx - High Sensitivity Measurement

Introduction

JEOL has recently announced a 4th generation GC/HR-TOFMS system, the JMS-T200GC AccuTOF-GCx, in 2015. The AccuTOF-GCx offers high sensitivity, high mass resolving power, high mass accuracy, and a wide dynamic range in combination with high-speed data acquisition.

In this application note, we show the high sensitivity measurement capability using this latest GC/HR-TOFMS system.

Experimental

We checked the system sensitivity by measuring a standard sample of octafluoronaphthalene (OFN) and standard dioxin samples. Mass spectra were acquired at a spectral acquisition rate of 0.3 seconds per spectrum. Splitless GC injections were used for all measurements reported here.

Results

OFN measurement result

We measured a 1pg/μL standard solution of OFN by injecting 1μL of the solution into the AccuTOF-GCx system. We observed a signal-to-noise ratio of 443 by creating a high-selectivity extracted ion chromatogram (EIC) with a narrow m/z range for the molecular ion of OFN (Figure 2a). The EI mass spectrum gave a mass accuracy of -0.8 mDa with a mass resolving power of 10,043 for the OFN molecular ion m/z 271.9859 (Figure 2b).

Dioxin measurement result

We measured standard dioxin solutions at concentrations of 50, 100 and 1000 fg/μL in order to evaluate the sensitivity and linearity of the calibration curve for 2,3,7,8-tetrachlorodibenzodioxin (TeCDD). The EICs for each sample are shown in Figure 4. The calibration curve created from the EIC data shows excellent linearity.



Figure 1. 4th generation of the JEOL GC/HR-TOFMS system JMS-T200GC "AccuTOF GCx"

Figure 5 shows the data for a 50 fg/μL injection. At the 50 fg/μL level, we can observe many interferences in the standard solution. However, the high-resolution EIC's created from the AccuTOF-GCx system showed complete separation between the isotopic peaks corresponding to the molecular ions of 2,3,7,8-TeCDD ($C_{12}H_4O_2Cl_4$: m/z 321.8931 and m/z 319.8960) and the peaks resulting from the low-level contaminants.

Conclusion

The JMS-T200GC AccuTOF-GCx is high-sensitivity and high-resolution GC/MS system. It is suitable not only for qualitative analysis but also for quantitative analysis. The 4th-generation model from the JEOL AccuTOF-GC series provides detection limits with good sensitivity for femtogram concentration levels.

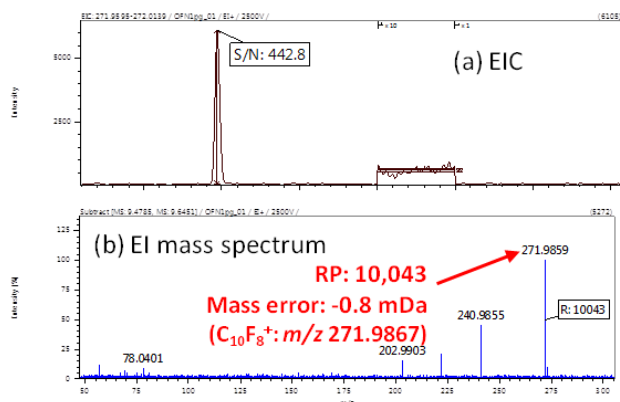
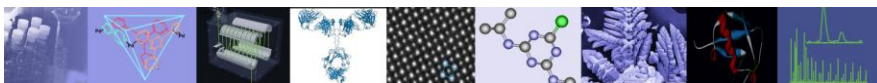


Figure 2. OFN 1pg/μL data,
(a) EIC: m/z 271.9867 \pm 50ppm, (b) EI mass spectrum

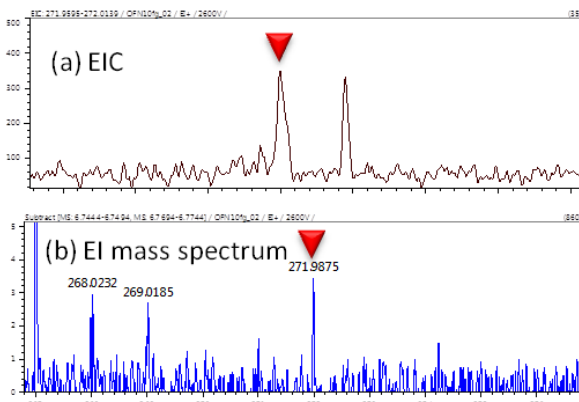
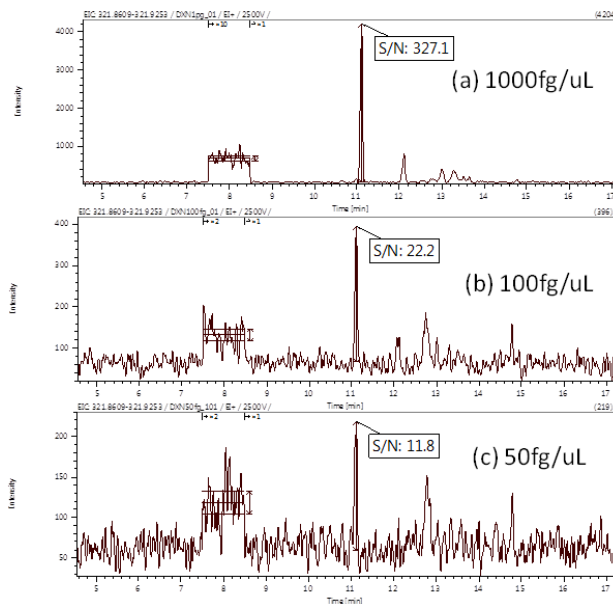


Figure 3. OFN 10fg/μL data, (a) EIC: m/z 271.9867 \pm 50ppm, (b) EI mass spectrum (enlarged)



Calibration curve: Linear
Area (ratio)=235.28001*Q+4197.45622
Correlation coefficient=0.9999680

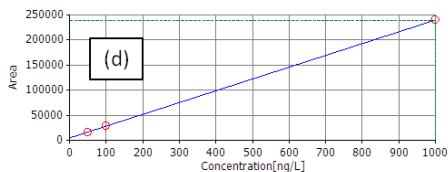


Figure 4. 2,3,7,8-TeCDD EIC: m/z 321.8931 \pm 50ppm, (a) 1000fg/μL, (b) 100fg/μL, (c) 50fg/μL
(d) Calibration curve

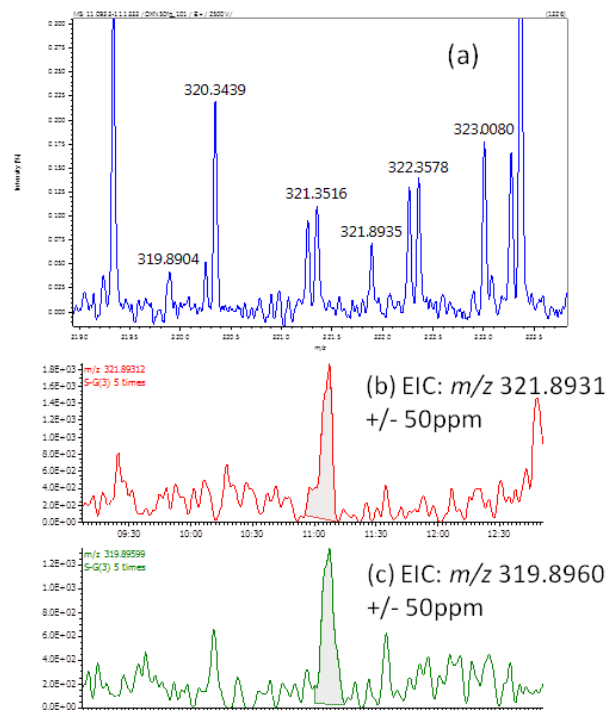


Figure 5. 2,3,7,8-TeCDD 50 fg/μL data
(a) EI mass spectrum (enlarged),
(b) EIC: m/z 321.8931 \pm 50ppm,
(c) EIC: m/z 319.8960 \pm 50ppm