

ICP-oTOFMS

APPLICATION NOTES

Simultaneous determination of hydride forming elements in Sea Water using ICP-oTOF MS.



INTRODUCTION

Two sea water samples were submitted for the analysis of arsenic. As the Optimass is a simultaneous multi element technique, other hydride-forming elements were analysed in the same suite. The Optimass and the Optimass Hydride Accessory were used to analyse As, Bi, Hg, Sb, Se and Sn. Sample preparation, results and detection limits are discussed.

SAMPLE COLLECTION AND PREPARATION

The samples were diluted ten-fold with 18 m Ω D.I. water and made up in 10% v/v HCl and 0.2 mg/mL KI. The samples were mixed and allowed to stand for 60 minutes for the reaction to be completed.

500 mL of sodium borohydride reagent solution was prepared by dissolving 3 g of NaBH₄ and 3 g NaOH in 500 mL of 18 m Ω D.I. water.

STANDARD PREPARATION

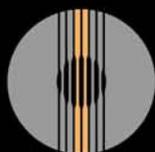
A series of four standards were prepared for the elements of interest. These were made up in the same acid and KI concentration as the samples.

INSTRUMENTATION

The instrument used, the Optimass, allows simultaneous acquisition of the entire mass range. This was optimized for sensitivity and resolution. The Smart Gate ion blanker was used to remove unwanted species, such as Ar. The hydride accessory was connected to the ICP torch via a "T-piece". This also allowed the spray chamber and nebulizer to remain connected allowing both the hydride and non hydride analytes to be analyzed without turning the torch off thus further increasing the sample throughput.

RESULTS

Table 1 shows the results for the two sea water samples. Table 2 shows the detection limits and calibration linearity obtained for each element. As can be seen, excellent detection limits and excellent R² values were obtained, showing that the calibration graphs were linear.



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Elements	Sample A Result (ppb)	Sample B Result (ppb)
As	6.03	33.4
Bi	10.50	12.80
Hg	16.20	<0.02
Sb	23.10	22.60
Sn	349.6	444.8

Table 1: Results obtained for the two sea water samples.

Elements	Detection Limit (ppb)	Calibration R ²
As	0.099	1.0000
Bi	0.007	1.0000
Hg	0.020	0.9997
Sb	0.016	1.0000
Sn	0.400	0.9945

Table 2: Detection limits and calibration R².

DISCUSSION

The Optimass and the Optimass Hydride Accessory can be automated to determine a range of elements in sea water samples. The hydride technique itself results in the removal of the sample matrix. Only the various elements in hydride form reach the plasma, hence in this application all of the sodium and chloride ions are removed, which eliminates any interferences associated with these ions. For the removal of some spectroscopic interferences the hydride generator can be used for elements which form stable hydrides such as As, Bi, Hg, Sb and Sn.

The Optimass only requires 25 seconds per sample. In this acquisition time all ICP-MS measurable hydride elements and isotopes can be analyzed and quantified because of the truly simultaneous nature of the data acquisition.

Also, as all masses can be displayed simultaneously, the user can view possible contaminants and elements previously not considered in real time. This can prompt a user to investigate what a particular peak is and then, if important, to quantify these.

