

Hg speciation by thermal desorption and quantification using a direct mercury analyzer

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Introduction

The mercury speciation in biological and environmental samples is particularly complex because of the different chemical forms that it assumes metal and the variety of the same behavior. However, it is extremely importance, not only to define the behavior and the destination of these compounds, but also the potential toxicological consequences of its presence in several systems¹. The objective of this work was to study speciation species of Hg by thermo desorption/atomic absorption spectrometry technique (TDAAS)² and determination the total Hg using a direct mercury analyzer (DMA-80 Milestone) that allows direct measurements of Hg without opening samples, based on the burning metal and gold amalgamation and subsequent thermal desorption; the equipment has also been used for metal speciation in soils and sediments³.

Results and discussion

Figure 1 shows the thermograms obtained, observing that the Hg-thermodesorption curves are characteristics in Hg²⁺ oxidation state and exhibit differences in temperature ranges corresponding to the maximum release of Hg. Some thermograms have more than one peak, at different temperatures, suggesting Hg interaction differences with the matrix and the existence of two species of Hg²⁺, a possibly bound to the mineral phase and the other bound to the soil organic phase, or different adsorption sites on the same adsorbent surface.

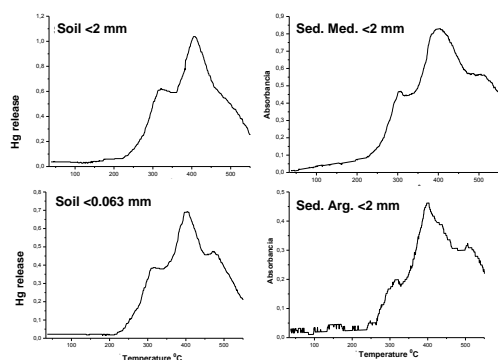


Figure 1. Thermograms obtained by TDAAS.

Table 1. Total Hg content of measured in the DMA.

Sample	VCRM ¹ (µg/kg)	THg (µg/kg) ²	RSD ³ (%)
Sed. Are. <2 mm	-	22.6 ± 1.8	7.8
Sed. Arg. <2 mm	-	123.2 ± 5.4	4.4
Sed. Med. <2 mm	-	163.6 ± 2.7	1.7
Soil <2 mm	-	143.7 ± 3.7	2.6
Soil <0.063 mm	-	516.3 ± 2.2	0.4
DORM-3	356.8 ± 6.3	356.8 ± 6.3	1.8
Mussel Tissue	61.0 ± 3.6	65.7 ± 0.5	0.4
Bivine Liver	5.36 ± 0.17	4.7 ± 0.4	8.0

Legend: ¹VCRM = Value of certified reference material of Hg.
²Mean ± standard deviation (n=3).
³RSD = Relative standard deviation.

Table 1 shows the total Hg content (<2 mm and <0.063 mm fractions) measured in the DMA, which ranged from 22.6 ± 1.8 to 163.6 ± 2.7 in the fraction <2 mm, increasing the sandy samples for more clay. Considering the relations among the fractions, an enrichment of Hg was observed in the finer fractions (<0.063 mm), probably due to higher clay. We used the *t*-Student test and all results revealed agreement at the 95% confidence level. The accuracy of the results was as expected, with relative standard deviations of no more than 8% (n=3).

Conclusion

The methods used in this work are simple, rapid, reproducible and accurate good results were obtained after analysis of certified reference materials. Further tests will be performed to continue the validation techniques.

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