

Inorganic Selenium Speciation in Mineral Water Samples using selective hydride generation AFS

Application Note APP165

The determination of inorganic selenium speciation is important measurement for biogeochemists studying selenium in environmental chemistry. It is also of great interest to groups providing abatement control as the form of selenium may affect the efficiency of the removal system. In general terms selenate (SeVI) is more difficult to remove and the majority of removal systems are based on the reduction of Selenium and subsequent adsorption of selenite (SeIV) or the precipitation of selenium (0). A simple method of inorganic selenium speciation is presented here based on selective hydride generation - AFS. The method relies on the fact that Selenate (SeVI) does not form a hydride species and therefore if samples are prepared without a pre-reduction step only selenite (SeIV) is determined. Selenium VI can therefore be determined as the difference between total selenium and selenite. In this application we demonstrate this approach for a natural water sample.

Procedure of total Selenium

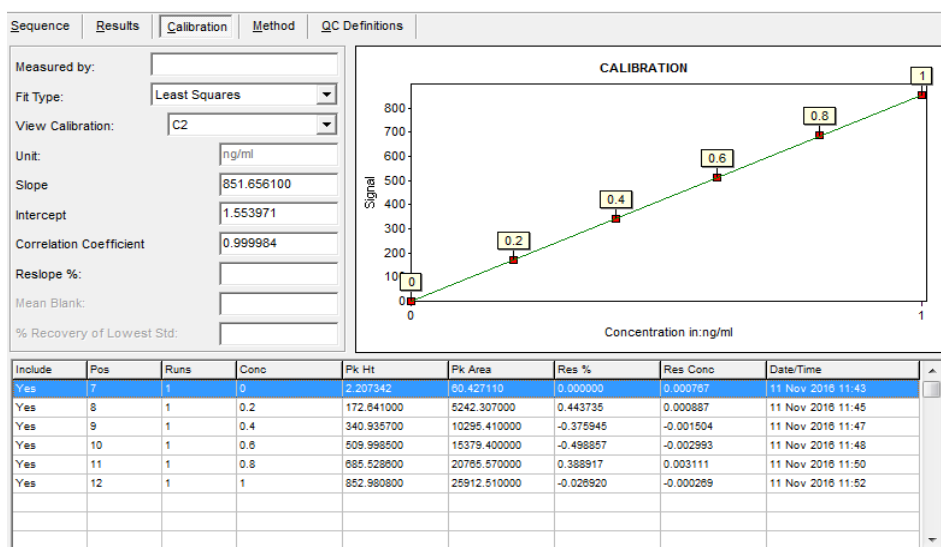
50ml of each water sample was transferred into clean digestion vessels to which 40ml of HCl was added. The samples were heated at 120°C for 30 min. Samples were cooled and diluted to 100ml volume with DI water.

Procedure for Selenite (SeIV)

25ml of each water sample was transferred into clean digestion vessels to which 20ml of HCl was added. Samples were diluted to 50ml volume with DI water.

PSA Millennium Excalibur Instrument was calibrated 0-1ng/ml. Calibration obtained can be seen in figure 1 while the Method settings used are shown in figure 2.

Figure 1 - Calibration between 0 to 1ppb Se



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Figure 2 Method Settings

Results and Conclusions

The results are presented in Table 1. A mineral water sample was prepared five times and analysed in duplicate for total selenium and selenite. The main form of selenium in the sample was found to be selenate which is quite typical for natural water samples. Selenite and selenate standards were also tested to confirm the accuracy of the method. When selenate was analysed without the heating no selenium was detected. For the procedure used for total selenium both species gave a good recovery.

Sample Reference	Selenite (ng/ml)	Total Selenium (ng/ml)
Duplicate 1	0.002 ± 0.002	0.548 ± 0.006
Duplicate 2	0.006 ± 0.001	0.561 ± 0.008
Duplicate 3	0.005 ± 0.001	0.551 ± 0.001
Duplicate 4	0.005 ± 0.001	0.545 ± 0.002
Duplicate 5	0.007 ± 0.001	0.542 ± 0.005
QC Se IV 0.5	0.463 ± 0.009	0.480 ± 0.003
QC Se VI 0.5	Not detected	0.474 ± 0.002

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