

Methods for Se speciation

Water samples and extracts are analyzed by anion chromatography (Hamilton PRP-X100 column in a Bischoff isocratic system) with post-column reduction, hydride generation and detection by inductively coupled plasma mass spectrometry (LC-HG-ICPMS; Thermo Fisher Element 2). The use of hydride generation provides improved sensitivity and thus better limits of reporting, but means that only Se(IV) (selenite), and Se(VI) (selenate) can be detected. Organoselenium species cannot be determined using this method.

Matrix	Fresh water	Marine water	Sediment, soil, sludge (a)	Biota (a)
Shipping	Top filled bottle; store/ship cool and dark (b)	Top filled bottle; store/ship cool and dark (b)	Top filled bottle; store/ship cool and dark	Freeze before shipping and, if possible, ship in freeze box
Minimum amount (c)	1 mL	1 mL	1 g	0.5 g
Preparation	Filter (0.45 μm) and dilute if required (d)	Filter (0.45 μm) and dilute 10-fold or more if required (d)	Homogenize; ultrasound-assisted extraction into 0.1 M phosphoric acid; filter (0.45 μm) and dilute if required (e)	Homogenize; ultrasound-assisted extraction into 1+1 methanol + water; filter (0.45 μm) and dilute 10-fold or more if required (f)
Limit of reporting (g)	Se(IV) 10 $\mu\text{g/L}$ Se(VI) 50 $\mu\text{g/L}$	Se(IV) 100 $\mu\text{g/L}$ Se(VI) 500 $\mu\text{g/L}$	Se(IV) 0.05 mg/kg Se(VI) 0.3 mg/kg	Se(IV) 0.05 mg/kg Se(VI) 0.3 mg/kg

Notes: (a) Please mark the sample documentation "Samples for research purposes only" and refer to our permit from the Swedish Board of Agriculture: Dnr 20-9304/12. (b) Do not freeze water samples; synthetic mixtures of Se(IV) and Se(VI) are stable ($\pm 10\%$) in the refrigerator for 30 days (T. Lindemann et al., *Fresenius Journal of Analytical Chemistry*, 368 (2000) 214-220). (c) This is the minimum amount of sample required for a single analysis to reach the given limits of reporting. Larger samples are required for duplicate measurements and recovery checks. (d) Acid mine drainage and waste waters may require much greater dilution factors than fresh and drinking waters; this will result in poorer limits of reporting than those given in the table. (e) Note that the sum of extractable Se species recovered and detected by our method may be much lower than the total Se concentration. We can perform other single step extractions for the same price at the customers' request, e.g. US EPA Method 1311 - toxicity characteristic leaching procedure, although this may not recover all Se either. (f) Ultrasound-assisted extraction into methanol/water normally provides quantitative recoveries of As species from fish, shellfish, etc., but efficiency for Se(IV) and Se(VI) has not yet been established. Customer suggestions or requests are therefore warmly welcomed. (g) The limit of reporting is normally set at a level corresponding to the limit of quantification (LOQ; 10 x SD for blanks). It is often possible to provide better performance for water samples than the values quoted here.