

## Methoden voor de bepaling van elementen

## 1 ANALYSEMETHODEN VOOR DE BEPALING VAN ELEMENTEN

In onderstaande tabel is een algemeen overzicht gegeven omtrent de minimaal toe te passen conservering, stabilisering en destructie van de diverse monstertypes.

Bijkomende informatie omtrent de conservering en behandeling van watermonsters wordt gegeven in WAC/I/A/010.

Voor de ontsluiting van de monsters wordt verwezen naar WAC/III/B/001 en WAC/III/B/002. Voor de bepaling van de totaalconcentraties als bedoeld in titel II van het VLAREM dienen deze ontsluitingsmethoden te worden toegepast.

Voor de bepaling van de opgeloste fractie van de elementen dient het monster gefiltreerd te worden over een membraanfilter, met een nominale poriëngrootte van 0.45 µm, zo snel mogelijk na monsternamen (te velde).

Opmerking: Indien neerslag wordt gevormd na filtratie en aanzuren van het monster of tijdens transport/bewaring, dient het monster gedgestrueerd te worden conform WAC/III/B/001 of WAC/III/B/002.

### Matrix: drink- en grondwater

	Conservering	Stabilisatie	Destructie
Elementen	HNO <sub>3</sub>	-	-
Hg <sup>(1)</sup>	HNO <sub>3</sub> of HCl	Min. 2% BrCl (< 48u na monsternamen)	-
		K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	<ul style="list-style-type: none"> <li>• Aqua regia</li> <li>• Kaliumpermanganaat/kalium peroxodisulfaat</li> <li>• BrCl, KT°, 24u of 60°C, 2u</li> </ul>
Sb	HNO <sub>3</sub>	Optioneel: HCl/HF/tartaarzuur	-
	of HCl	-	

(1) Bij bepaling van Hg met ICP-MS dient onafhankelijk van de conservering geen ontsluiting te worden uitgevoerd.

Voor drink- en grondwater dient geen ontsluiting te worden uitgevoerd (uitgezonderd voor Hg bij stabilisatie met K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>).

### Matrix: afval- en oppervlaktewater

	Conservering	Stabilisatie	Destructie
Elementen	HNO <sub>3</sub>	-	<ul style="list-style-type: none"> <li>• Aqua regia of HNO<sub>3</sub></li> </ul>
Hg <sup>(1)</sup>	HNO <sub>3</sub> of HCl	Min. 2% BrCl (< 48u na monsternamen)	<ul style="list-style-type: none"> <li>• Aqua regia of HNO<sub>3</sub></li> <li>• BrCl, KT°, 24u of 60°C, 2u</li> </ul>
		K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	<ul style="list-style-type: none"> <li>• Aqua regia</li> <li>• Kaliumpermanganaat/kalium peroxodisulfaat</li> <li>• BrCl, KT°, 24u of 60°C, 2u</li> </ul>
Sb, Sn	HNO <sub>3</sub> of HCl	-	<ul style="list-style-type: none"> <li>• Aqua regia</li> </ul>
Ag	HNO <sub>3</sub>	HCl	<ul style="list-style-type: none"> <li>• Aqua regia of HNO<sub>3</sub></li> </ul>
	of HCl	-	

Al <sub>2</sub> O <sub>3</sub> /CeO <sub>2</sub> TiO <sub>2</sub> /SnO <sub>2</sub> (2)	HNO <sub>3</sub> of HCl of H <sub>2</sub> SO <sub>4</sub>	-	• WAC/III/B/002 Bijlage E
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- (1) Bij bepaling van Hg met ICP-MS dient een aqua regia of HNO<sub>3</sub> ontsluiting te worden uitgevoerd.
- (2) Enkel van toepassing voor de matrix afvalwater.

Voor afval- en oppervlaktewater dient een ontsluiting te worden uitgevoerd conform WAC/III/B/001 of WAC/III/B/002. Indien specifiek het gehalte aan Al incl. Al<sub>2</sub>O<sub>3</sub>, Ce incl. CeO<sub>2</sub>, Ti incl. TiO<sub>2</sub> en/of Sn incl. SnO<sub>2</sub> wordt aangevraagd, wordt de speciale ontsluitingsmethode zoals beschreven in WAC/III/B/002 bijlage E toegepast. Op het analyseverslag dient duidelijk vermeld te worden welke ontsluitingsmethode werd toegepast.

De volgende analysemethoden kunnen gebruikt worden voor het bepalen van elementen in water.

aluminium	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• ISO 12020: 1997 Water quality – Determination of aluminium – Atomic absorption spectrometric methods</li> </ul>
antimoon	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• ISO 17378-1:2014 Water quality - Determination of arsenic and antimony - Part 1: Method using hydride generation atomic fluorescence spectrometry (HG-AFS)</li> <li>• ISO 17378-2:2014 Water quality - Determination of arsenic and antimony - Part 2: Method using hydride generation atomic absorption spectrometry (HG-AAS) (WAC/III/B/012)</li> </ul>
arsen	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines</li> </ul>

	<p>(ISO 17294-1:2004)</p> <ul style="list-style-type: none"> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• ISO 17378-1:2014 Water quality - Determination of arsenic and antimony - Part 1: Method using hydride generation atomic fluorescence spectrometry (HG-AFS)</li> <li>• ISO 17378-2:2014 Water quality - Determination of arsenic and antimony - Part 2: Method using hydride generation atomic absorption spectrometry (HG-AAS) (WAC/III/B/012)</li> <li>• NEN 6432:1993 Water – Bepaling van het gehalte aan arseen met behulp van atomaire absorptiespectrometrie (hydridegeneratietechniek). Ontsluiting met salpeterzuur en zoutzuur.</li> </ul>
barium	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> </ul>
boor	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> </ul>
cadmium	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• ISO 8288: 1986 Water quality – Determination of cobalt, nickel, copper, zinc, cadmium and lead – Flame atomic absorption spectrometric methods</li> <li>• ISO 5961: 1994 Water quality: Determination of cadmium by atomic absorption spectrometry</li> </ul>
calcium	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry</li> </ul>

	<p>(ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</p> <ul style="list-style-type: none"> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 14911:1999 Water quality - Determination of dissolved Li<sup>+</sup>, Na<sup>+</sup>, NH<sub>4</sub><sup>+</sup>, K<sup>+</sup>, Mn<sup>2+</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>, Sr<sup>2+</sup> and Ba<sup>2+</sup> using ion chromatography - Method for water and waste water (ISO 14911:1998)</li> </ul>
cerium	<ul style="list-style-type: none"> <li>• WAC/III/B/010 Bepaling van de geselecteerde elementen met inductief gekoppeld plasma – atomaire emissiespectrometrie</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> </ul>
chrom	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• EN 1233: 1996 Water quality – Determination of chromium – Atomic absorption spectrometric methods</li> </ul>
ijzer	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> </ul>
fosfor	<ul style="list-style-type: none"> <li>• Zie WAC/III/D in functie van het matrixtype</li> </ul>
kalium	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines</li> </ul>

	<p>(ISO 17294-1:2004)</p> <ul style="list-style-type: none"> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 14911:1999 Water quality - Determination of dissolved <math>\text{Li}^+</math>, <math>\text{Na}^+</math>, <math>\text{NH}_4^+</math>, <math>\text{K}^+</math>, <math>\text{Mn}^{2+}</math>, <math>\text{Ca}^{2+}</math>, <math>\text{Mg}^{2+}</math>, <math>\text{Sr}^{2+}</math> and <math>\text{Ba}^{2+}</math> using ion chromatography - Method for water and waste water (ISO 14911:1998)</li> </ul>
kobalt	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• ISO 8288: 1986 Water quality – Determination of cobalt, nickel, copper, zinc, cadmium and lead – Flame atomic absorption spectrometric methods</li> </ul>
koper	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• ISO 8288: 1986 Water quality – Determination of cobalt, nickel, copper, zinc, cadmium and lead – Flame atomic absorption spectrometric methods</li> </ul>
lood	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• ISO 8288: 1986 Water quality – Determination of cobalt, nickel, copper, zinc, cadmium and lead – Flame atomic absorption spectrometric methods</li> </ul>
magnesium	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected</li> </ul>



	<p>elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</p> <ul style="list-style-type: none"> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 14911:1999 Water quality - Determination of dissolved <math>\text{Li}^+</math>, <math>\text{Na}^+</math>, <math>\text{NH}_4^+</math>, <math>\text{K}^+</math>, <math>\text{Mn}^{2+}</math>, <math>\text{Ca}^{2+}</math>, <math>\text{Mg}^{2+}</math>, <math>\text{Sr}^{2+}</math> and <math>\text{Ba}^{2+}</math> using ion chromatography - Method for water and waste water (ISO 14911:1998)</li> </ul>
mangaan	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> </ul>
molybdeen	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> </ul>
natrium	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 14911:1999 Water quality - Determination of dissolved <math>\text{Li}^+</math>, <math>\text{Na}^+</math>, <math>\text{NH}_4^+</math>, <math>\text{K}^+</math>, <math>\text{Mn}^{2+}</math>, <math>\text{Ca}^{2+}</math>, <math>\text{Mg}^{2+}</math>, <math>\text{Sr}^{2+}</math> and <math>\text{Ba}^{2+}</math> using ion chromatography - Method for water and waste water (ISO 14911:1998)</li> </ul>
nikkel	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively</li> </ul>

	<p>coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</p> <ul style="list-style-type: none"> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• ISO 8288: 1986 Water quality – Determination of cobalt, nickel, copper, zinc, cadmium and lead – Flame atomic absorption spectrometric methods</li> </ul>
seleen	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• ISO/TS 17379-1:2013 Water quality - Determination of selenium - Part 1: Method using hydride generation atomic fluorescence spectrometry (HG-AFS)</li> <li>• ISO/TS 17379-2:2013 Water quality - Determination of selenium - Part 2: Method using hydride generation atomic absorption spectrometry (HG-AAS) (WAC/III/B/012)</li> </ul>
tin	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> </ul>
titanium	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> </ul>
zilver	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines</li> </ul>



	(ISO 17294-1:2004) <ul style="list-style-type: none"> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> </ul>
zink	<ul style="list-style-type: none"> <li>• NBN EN ISO 11885:2009 Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007) (WAC/III/B/010)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• NBN EN ISO 15586:2003 Water quality – Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586:2003)</li> <li>• ISO 8288: 1986 Water quality – Determination of cobalt, nickel, copper, zinc, cadmium and lead – Flame atomic absorption spectrometric methods</li> </ul>

Voor de bepaling van **kwik** is het toepassen van een ontsluiting afhankelijk van de conserverings- en bepalingstechniek en het type water.

Voor de conservering en behandeling van watermonsters wordt verwezen naar WAC/I/A/010.

Bij de bepaling van kwik met CV-AAS en CV-AFS (WAC/III/B/014) en BrCl als conservering reagens dient voor drink- en grondwater geen ontsluiting te worden uitgevoerd. Voor afval- en oppervlaktewater dient een ontsluiting te worden uitgevoerd, tenzij de nodige gegevens beschikbaar zijn die aantonen dat het type afvalwater dat door het laboratorium wordt geanalyseerd gelijkwaardige resultaten geeft zonder ontsluiting bij verhoogde temperatuur.

Volgende ontsluitingsmethoden kunnen worden toegepast:

- WAC/III/B/001 Ontsluiting voor de bepaling van geselecteerde elementen in water – salpeterzuurontsluiting
- WAC/III/B/002 Ontsluiting voor de bepaling van geselecteerde elementen in water – aqua regia ontsluiting
- Ontsluiting met BrCl oplossing bij kamertemperatuur gedurende min. 24 u volgens ISO12846:2012 § 7.4
- Ontsluiting met 2 à 4% BrCl-reagens bij 60°C gedurende 2 uur. Een volledige oxidatie kan worden bepaald door visueel te controleren of een permanente gele kleur overblijft in het monster of door gebruik te maken van een zetmeeljodide indicatorpapier om resterend vrij oxidatiemiddel te testen.<sup>1</sup>

Bij de bepaling van kwik met CV-AAS en CV-AFS (WAC/III/B/014) en kaliumdichromaat als conservering reagens dient zowel drink-, grond-, afval- en oppervlaktewater ontsloten te worden.

<sup>1</sup> Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry, August 2002.

Volgende ontsluitingsmethoden kunnen worden toegepast:

- WAC/III/B/002 Ontsluiting voor de bepaling van geselecteerde elementen in water – aqua regia ontsluiting
- Ontsluitingsmethode met kalium permanganaat/ kalium peroxodisulfaat  
Breng 100 ml monster geconserveerd met HNO<sub>3</sub> en K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> (0.05%), in een ontsluitingsrecipiënt  
Voeg 15 ml kalium permanganaat oplossing (50 g KMnO<sub>4</sub>/liter), 1 ml HNO<sub>3</sub> en 1 ml H<sub>2</sub>SO<sub>4</sub> toe.  
Laat de oplossing 15 min. staan, en voeg 10 ml kalium peroxodisulfaat oplossing (40 g K<sub>2</sub>S<sub>2</sub>O<sub>6</sub>/liter) toe  
Plaats het recipiënt in een verwarmingstoestel (bv. verwarmingsblok of waterbad) bij 95°C gedurende 2uur  
Indien nodig, voeg bijkomend kalium permanganaat oplossing toe  
Laten afkoelen, en aanlengen tot gewenst volume.
- Ontsluiting met BrCl oplossing bij kamertemperatuur gedurende min. 24 u volgens ISO 12846:2012 § 7.4
- Ontsluiting met 2 à 4% BrCl-reagens bij 60°C gedurende 2 uur. Een volledige oxidatie kan worden bepaald door visueel te controleren of een permanente gele kleur overblijft in het monster of door gebruik te maken van een zetmeeljodide indicatorpapier om resterend vrij oxidatiemiddel te testen.

Bij de bepaling van Hg met ICP-MS dient onafhankelijk van de conservering voor drink- en grondwater geen ontsluiting te worden uitgevoerd. Bijkomend dient bij de analyse AuCl<sub>3</sub> te worden toegevoegd aan zowel standaarden als monsters om geheugeneffecten in de verstuurkamer te minimaliseren<sup>2</sup>. Voor afval- en oppervlaktewater dient een ontsluiting te worden uitgevoerd.

Volgende ontsluitingsmethoden kunnen worden toegepast:

- WAC/III/B/001 Ontsluiting voor de bepaling van geselecteerde elementen in water – salpeterzuurontsluiting
- WAC/III/B/002 Ontsluiting voor de bepaling van geselecteerde elementen in water – aqua regia ontsluiting

De volgende analysemethoden kunnen gebruikt worden voor de bepaling van kwik in water.

Kwik	<ul style="list-style-type: none"> <li>• NBN EN ISO 12846:2012 Water quality : Determination of mercury - Method using atomic absorption spectrometry (AAS) with and without enrichment (ISO 12846:2012) (WAC/III/B/014)</li> <li>• NBN EN ISO 17852:2008 Water quality : Determination of mercury - Method using atomic fluorescence spectrometry (ISO 17852:2006) (WAC/III/B/014)</li> <li>• NBN EN ISO 17294-1:2006 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 1: General guidelines (ISO 17294-1:2004)</li> <li>• NBN EN ISO 17294-2:2004 Water quality – Application of inductively coupled plasma mass spectrometry (ICP-MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003) (WAC/III/B/011)</li> <li>• EPA 200.8 Determination of trace elements in waters and wastes by inductively coupled plasma- mass spectrometry.</li> </ul>
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<sup>2</sup> B.T. Sturman, *Comment on 'Determination of mercury in potable water by ICP-MS using gold as stabilising agent*, J. Anal. At. Spectrom., 2000, **15**, 1512.

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