

Foodstuffs - Determination of elements and their chemical species -Determination of Ag, As, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Tl, U and Zn in foodstuffs by inductively coupled plasma mass spectrometry (ICP-MS) after pressure digestion

EESTI STANDARDI EESSÕNA

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See Eesti standard EVS-EN 17851:2023 sisaldab Euroopa standardi EN 17851:2023 ingliskeelset teksti.	This Estonian standard EVS-EN 17851:2023 consists of the English text of the European standard EN 17851:2023.
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English Version

Foodstuffs - Determination of elements and their chemical species - Determination of Ag, As, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Tl, U and Zn in foodstuffs by inductively coupled plasma mass spectrometry (ICP-MS) after pressure digestion

Produits alimentaires - Détermination des éléments et de leurs espèces chimiques - Détermination des éléments Ag, As, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Tl, U et Zn dans les produits alimentaires par spectrométrie de masse avec plasma à couplage inductif (ICP-MS) après digestion sous pression

Lebensmittel - Bestimmung von Elementen und ihren Verbindungen - Bestimmung von Ag, As, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Tl, U und Zn mit induktiv gekoppelter Plasma-Massenspektrometrie (ICP-MS) nach Druckaufschluss

This European Standard was approved by CEN on 5 June 2023.

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European foreword

This document (EN 17851:2023) has been prepared by Technical Committee CEN/TC 275 “Food analysis – Horizontal methods”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2024, and conflicting national standards shall be withdrawn at the latest by January 2024.

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1 Scope

This document specifies a procedure for the determination of Ag, As, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Tl, U and Zn in foodstuffs by inductively coupled plasma mass spectrometry (ICP-MS) after pressure digestion.

The following foodstuffs were analysed for the elements listed in Table 1 in an interlaboratory study: Banana (deep-frozen), Cocoa powder, Wheat noodle powder, Currant nectar (deep-frozen), Milk powder, Oyster (dried), Celery (dried), Dogfish liver (dried), Liver (deep-frozen), Kale (dried).

Table 1 — Validated range^a

Element	Mass fraction mg/kg	
	Lower range	Upper range
Arsenic	0,02	36,6
Lead	0,004	0,58
Cadmium	0,006	15,2
Chromium	0,06	5,71
Cobalt	0,03	7,49
Copper	0,71	74,0
Manganese	0,31	73,5
Molybdenum	0,05	1,88
Nickel	0,11	11,0
Selenium	0,06	8,70
Silver	0,011	1,98
Thallium	0,008	0,12
Uranium	0,003	0,26
Zinc	1,8	1 582

^a Table 1 lists the ranges analysed in the interlaboratory study, indicating for each element the lowest and highest content found in the ten analysed food matrices (see Annex B, Table B.1 to Table B.14). The lower limit of the procedure's range varies depending on the food matrix and the food's water content. It is a laboratory-specific value and is specified by the laboratory for each element when calculating the limit of quantification (see 9.2).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13804, *Foodstuffs - Determination of elements and their chemical species - General considerations and specific requirements*

EN 13805, *Foodstuffs - Determination of trace elements - Pressure digestion*

EN 15765, *Foodstuffs - Determination of trace elements - Determination of tin by inductively coupled plasma mass spectrometry (ICP-MS) after pressure digestion*

EN 17264, *Foodstuffs - Determination of elements and their chemical species - Determination of aluminium by inductively coupled plasma mass spectrometry (ICP-MS)*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 Principle

The sample is digested. For the digestion the pressure digestion process in EN 13805 shall be used, in the case of foodstuffs with a low water content, after adding water. In the digestion solution, the elements silver, arsenic, cadmium, cobalt, chromium, copper, manganese, molybdenum, nickel, lead, selenium, thallium, uranium and zinc are quantified by ICP-MS. For this purpose, the digestion solution is nebulized and the aerosol is transferred to an inductively coupled argon plasma where the elements are ionized. The ions are transferred via a system of cones into a mass spectrometer, where they are separated according to mass-to-charge ratio and detected by pulse and/or analogue detector.

The respective content of the elements mentioned in Clause 1 is understood as the total content measured using this described procedure. It is expressed in mg/kg or mg/l, depending on the sample type.

For other elements not specified within the scope, other documents can be considered, e.g. EN 15763. For the determination of aluminium and tin in foodstuffs refer to EN 17264 and EN 15765.

5 Reagents

The chemicals, gases and water used shall be free enough from the elements to be determined to not affect the results. Unless otherwise specified, "solutions" are understood to be aqueous solutions.

5.1 Nitric acid, mass fraction of min. $\omega = 65 \%$, density $\rho \approx 1,4 \text{ g/ml}$.

5.2 Stock solutions

A commercially available multi-element stock solution, for example with $\rho = 10 \text{ mg/l}$, can be used for silver, cadmium, cobalt, chromium, copper, manganese, molybdenum, nickel, lead, thallium, uranium and for example with $\rho = 100 \text{ mg/l}$ for arsenic, selenium and zinc.