

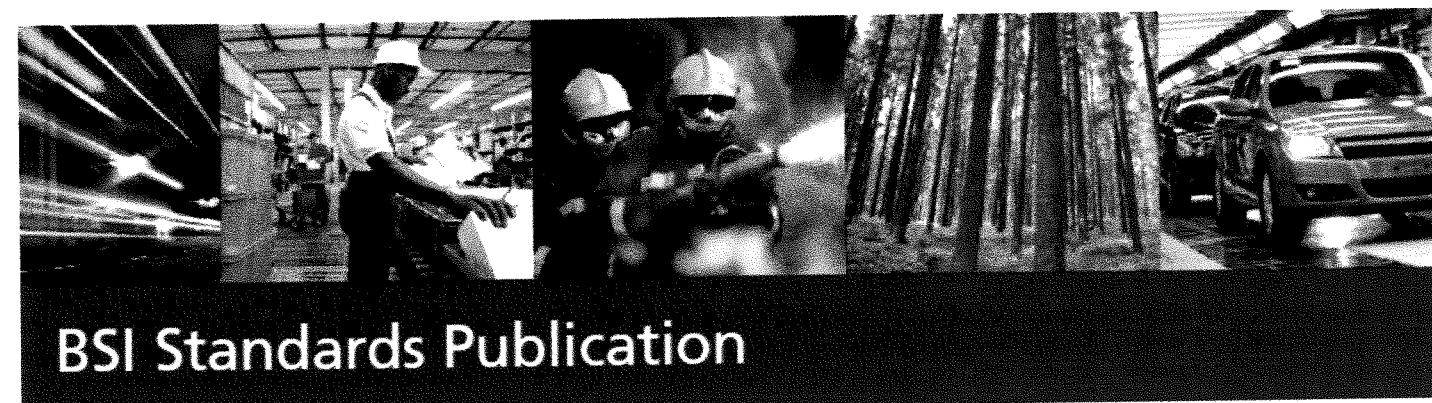
Busta prova orale numero 1

Accertamento lingua inglese busta numero 1

BS EN 15407:2011

La/Il Candidata/o risponda ai seguenti quesiti:

- 1) Gestione dei gas tecnici con particolare riguardo per il gas Ossigeno necessario per il funzionamento di analizzatore elementare.
- 2) Il mineralizzatore a microonde: descrizione e accorgimenti per la preparativa di campioni ambientali.
- 3) Norme di comportamento in laboratorio.
- 4) Accertamento lingua inglese.



Solid recovered fuels — Methods for the determination of carbon (C), hydrogen (H) and nitrogen (N) content

1. Scope

This European Standard specifies a method for the determination of total carbon, hydrogen and nitrogen contents in solid recovered fuels by instrumental techniques.

This method is applicable for concentrations on dry matter basis of C over 0,1 %, N over 0,01 % and H over 0,1 %.

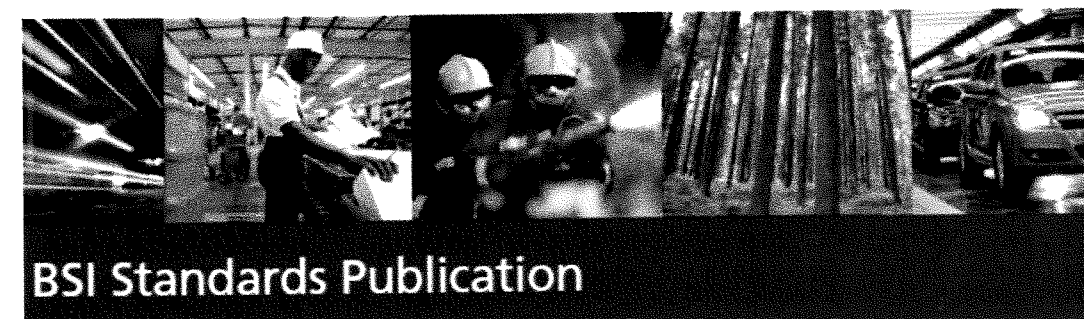
BS EN 15407:2011
EN 15407:2011 (E)

5 Principle

The method is based on the complete oxidation of the sample ("flash combustion" instruments can also be used) which converts all organic substances into combustion products. The resulting combustion gases pass through a reduction furnace and are swept into the chromatographic column by the carrier gas (helium) where they are separated and detected quantitatively by appropriate instrumental gas analysis procedures (for example by a thermal conductivity detector (TCD)). The samples are held in a suitable container (tin or other crucible) and then dropped inside the quartz tube furnace at about 1 000 °C in an oxygen stream for complete oxidation in the presence of a catalyst layer. Excess oxygen is removed by contact with copper, while nitrogen oxides are reduced to elemental nitrogen.

La/Il Candidata/o risponda ai seguenti quesiti:

- 1) Il laboratorio chimico analitico di servizio e il software LIMS: descrivere struttura e funzioni.
- 2) Descrizione e schema a blocchi di uno spettrometro ICP-OES.
- 3) Modalità di acquisto sul MEPA.
- 4) Accertamento lingua inglese.



**Foodstuffs - Determination of calcium, copper,
iron, magnesium, manganese, phosphorus,
potassium, sodium, sulfur and zinc by ICP-OES**

BS EN 16943:2017
EN 16943:2017 (E)

1 Scope

This European Standard describes a method for the determination of calcium, copper, iron, magnesium, manganese, phosphorus, potassium, sodium, sulfur and zinc in different foodstuffs using optical emission spectrometry with inductively coupled plasma (ICP-OES) after pressure digestion.

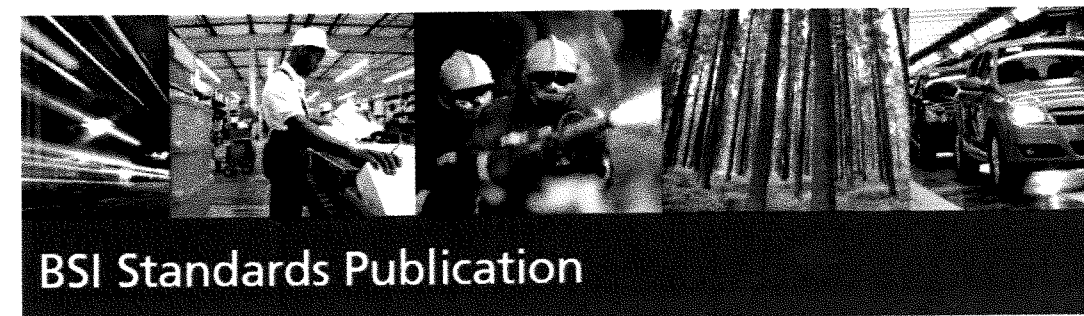
This method has been validated in an interlaboratory study according to ISO 5725 [1] on infant formula soya based, cheese, chicken meat, wheat flour, apple juice, lobster and milk (see elements ranges Table 1 and validation data in Annex B).

3 Principle

After digestion of the sample with the pressure digestion process described in EN 13805, calcium, copper, iron, magnesium, manganese, phosphorus, potassium, sodium, sulfur and zinc are determined quantitatively with the ICP-OES [2]. The digestion solution is nebulized, the aerosol is directed into an inductively coupled argon plasma, where the elements are atomized and excited for radiation. The emission radiation is resolved spectrally and its intensity determined at element-specific wavelengths with a detector system. Ionization interference can be minimized using an ionization buffer.

La/Il Candidata/o risponda ai seguenti quesiti:

- 1) L'acqua nel laboratorio chimico analitico: caratteristiche e impianti di produzione.
- 2) Calcolo delle prestazioni di uno spettrometro ICP-OES.
- 3) I dispositivi di protezione individuale (DPI).
- 4) Accertamento lingua inglese.



Sludge, treated biowaste and soil — Determination of elements using inductively coupled plasma optical emission spectrometry (ICP-OES)

BS EN 16170:2016
EN 16170:2016 (E)

1 Scope

This European Standard specifies a method for the determination of the following elements in *aqua regia* or nitric acid digest solutions of sludge, treated biowaste and soil:

3 Principle

Digests of sludge, treated biowaste or soil with nitric acid or *aqua regia* (see EN 16173 and EN 16174) are analysed by inductively coupled plasma optical emission spectrometry (ICP-OES) using sequential or simultaneous optical systems and axial or radial viewing of the plasma.

The instrument measures characteristic emission spectra by optical spectrometry. Analyte species originating in the digest solution are nebulised and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive devices.

NOTE For the determination of tin only *aqua regia* extraction applies (EN 16174).

Busta prova orale numero 4

Accertamento lingua inglese busta numero 4

BS EN 15510:2017

La/Il Candidata/o risponda ai seguenti quesiti:

- 1) Il laboratorio chimico analitico di servizio e il software LIMS: la gestione del magazzino reagenti.
- 2) Descrizione dell'analizzatore elementare CNS con particolare riferimento alla analisi di un suolo agronomico.
- 3) Come funziona il MEPA per la PA e quali sono i vantaggi.
- 4) Accertamento lingua inglese.



Animal feeding stuffs - Methods of sampling and analysis - Determination of calcium, sodium, phosphorus, magnesium, potassium, iron, zinc, copper, manganese, cobalt, molybdenum and lead by ICP-AES

BS EN 15510:2017
EN 15510:2017 (E)

1 Scope

This European Standard specifies the inductively coupled plasma atomic emission spectroscopy (ICP-AES) method for the determination of the elements calcium, sodium, phosphorus, magnesium, potassium, iron, zinc, copper, manganese, cobalt, molybdenum and lead.

4 Principle

For the determination of the elements calcium, sodium, phosphorus, magnesium, potassium, iron, zinc, copper, manganese, cobalt, molybdenum, lead, a test portion of the sample is

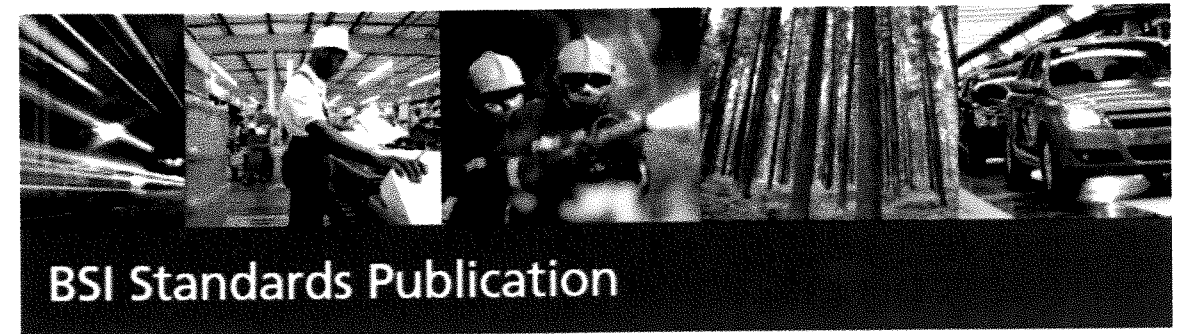
- dry ashed and dissolved in hydrochloric acid for feeds mainly consisting of organic matter or
- wet digested with hydrochloric acid for feeds mainly consisting of inorganic matter.

For the determination of extractable lead in minerals and feeds, containing phyllosilicates (e.g. kaolinite clay) wet digestion with nitric acid should be used.

The concentration of the elements calcium, sodium, phosphorus, magnesium, potassium, iron, zinc, copper, manganese, cobalt, molybdenum and lead is determined by inductively coupled plasma atomic emission spectrometry (ICP-AES) using external calibration or standard addition technique.

La/Il Candidata/o risponda ai seguenti quesiti:

- 1) Gestione dei gas tecnici con particolare riguardo per il gas Argon necessario per il funzionamento di spettrometro ICP-OES.
- 2) Procedure di validazione di un metodo analitico con particolare riferimento alla spettrometria ICP-OES.
- 3) I pittogrammi e la segnaletica in laboratorio.
- 4) Accertamento lingua inglese.



Animal and vegetable fats and oils — Determination of trace elements by inductively coupled plasma optical emission spectroscopy (ICP-OES)

1 Scope

This International Standard specifies an inductively coupled plasma optical emission spectroscopic method (ICP-OES) for the determination of the trace element content in oils. Depending on the dilution solvent used, most types of vegetable oils can be analysed (crude, degummed, refined, bleached, deodorized and hardened oils) and nearly all types of lecithins and phosphatides. Milk and milk products (or fat coming from milk and milk products) are excluded from the scope of this International Standard.

This method is only suitable when the elements are present in a solubilized form. Fine particles, such as bleaching earth, metal particles and rust, can result in poor recovery of the trace elements present as nebulization and atomization problems affect the ICP-OES analysis.

NOTE The only suitable non-ashing direct method for samples containing fine particles is graphite furnace atomic absorption spectrometry.

4 Principle

Solvent-diluted vegetable oils are analysed for trace elements by direct aspiration. Liquid samples are nebulized and carried into the excitation source by a flowing gas. Atoms are quantified by measuring the specific emission lines produced by atoms decaying from high energy levels.

Accertamento lingua inglese busta numero 6

BS EN 15621:2012



Animal feeding stuffs — Determination of calcium, sodium, phosphorus, magnesium, potassium, sulphur, iron, zinc, copper, manganese and cobalt after pressure digestion by ICP-AES

1 Scope

This European Standard specifies a method for the determination of the minerals calcium, sodium, phosphorus, magnesium, potassium and sulphur and the elements iron, zinc, copper, manganese, cobalt in animal feeding stuffs by inductively coupled plasma atomic emission spectrometry (ICP-AES) after pressure digestion.

The method was fully statistically tested and evaluated within 11 animal feeding stuff samples for the minerals calcium, sodium, phosphorus, magnesium, potassium and sulphur and the elements iron, zinc, copper, manganese and cobalt.

The method limit of quantification for each element is dependent on the sample matrix as well as on the instrument. The method is not applicable for determination of low concentrations of elements. A limit of quantification of 1 mg/kg should normally be obtained.

NOTE This method can also be used for the determination of minerals in products with high mineral content (> 5 %), yet for this purpose other more precise analytical techniques are available.

3 Principle

For the determination of calcium, sodium, phosphorus, magnesium, potassium and sulphur, iron, zinc, copper, manganese, cobalt, molybdenum, lead, cadmium and arsenic a test portion of the sample is digested under pressure.

The concentration of the elements is determined by inductively coupled plasma atomic emission spectrometry (ICP-AES) using external calibration or standard addition technique.

WARNING — The use of this European Standard can involve hazardous materials, operations and equipment. This standard does not purport to address all the safety problems associated with its use. It is the responsibility of the user of this European Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Busta prova orale numero 6

La/Il Candidata/o risponda ai seguenti quesiti:

- 1) Il laboratorio chimico analitico di servizio e il software LIMS: la ricezione dei campioni in entrata.
- 2) La manutenzione ordinaria e straordinaria della strumentazione scientifica con particolare riferimento allo spettrometro ICP-OES.
- 3) Modalità di acquisto di beni e servizi per il laboratorio chimico analitico nella PA con la procedura di affidamento: richiesta d'offerta.
- 4) Accertamento lingua inglese.