

Water quality —

Part 2: Physical, chemical and biochemical methods —

Section 2.29 Determination of cobalt, nickel, copper, zinc, cadmium and lead: flame atomic absorption spectrometric methods —

[ISO title: Water quality —
Determination of cobalt, nickel, copper,
zinc, cadmium and lead — Flame atomic
absorption spectrometric methods]

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National foreword

This Section of BS 6068 is published by BSI Standards Limited, under licence from The British Standards Institution.

This Section of BS 6068, which has been prepared under the direction of the Environment and Pollution Standards Committee, is identical with ISO 8288-1986 “*Water quality — Determination of cobalt, nickel, copper, zinc, cadmium and lead — Flame atomic absorption spectrometric methods*”. The international standard was prepared by subcommittee 2, Physical, chemical and biochemical methods, of Technical Committee 147, Water quality, of the International Organization for Standardization (ISO) as a result of discussion in which the UK participated.

This Section of BS 6068 partially supersedes BS 2690-1:1964 which is withdrawn.

This British Standard is being published in a series of Parts subdivided into Sections that will generally correspond to particular international standards. Sections are being, or will be, published in Parts 1 to 6, which together with Part 0, are listed below.

- *Part 0: Introduction;*
- *Part 1: Glossary;*
- *Part 2: Physical, chemical and biochemical methods;*
- *Part 3: Radiological methods;*
- *Part 4: Microbiological methods;*
- *Part 5: Biological methods;*
- *Part 6: Sampling.*

Terminology and conventions. The text of the international standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

In British Standards it is current practice to use the symbol “L” for litre (and in its submultiples) rather than “l”, and to use the spelling “sulphur”, etc., instead of “sulfur”, etc.

Wherever the words “this International Standard” appear, referring to this standard, they should be read as “this Section of this British Standard”.

NOTE *Typographical errors.* In 18.6, paragraph 1, line 1, and paragraph 3, line 1, “solutions” should be read as “solution”.

In 22.3, paragraph 3, line 1, “neutral” should be read as “natural”.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This International Standard specifies three methods for the determination of cobalt, nickel, copper, zinc, cadmium and lead in water by flame atomic absorption spectrometry:

Section 1: method A, for direct determination by flame atomic absorption spectrometry;

Section 2: method B, for determination by flame atomic absorption spectrometry after chelation (APDC) and extraction (MIBK);

Section 3: method C, for determination by flame atomic absorption spectrometry after chelation (HMA-HMDC) and extraction (DIPK-xylene).

2 Field of application

2.1 Method A is particularly applicable when concentrations of elements to be analysed are relatively high and when there are no interferences.

When the samples are of a complex or unknown nature or when they contain high concentrations of dissolved solids (brines or brackish waters) method A is not applicable and either method B or C should be selected.

The concentrations of elements which can be determined by method A may vary according to the characteristics of the atomic absorption spectrometric apparatus used but are generally in the ranges indicated in Table 1.

Table 1

Element to be determined	Range of determination (mg/l)
Cobalt	0,1 to 10
Nickel	0,1 to 10
Copper	0,05 to 6
Zinc	0,05 to 2
Cadmium	0,02 to 2
Lead	0,2 to 10

If the concentrations are greater than the upper limits indicated in the table, the sample may be diluted before analysis.

2.2 Methods B and C are applicable when concentrations of elements to be analysed in the sample (or dilution of the sample) are greater than 0,5 µg/l.

2.2.1 Method B

The concentrations of the elements which can be determined by method B may vary according to the characteristics of the atomic absorption spectrometer used but are generally in the ranges indicated in Table 2.

Table 2

Element to be determined	Range of determination (µg/l)
Cobalt	1 to 200
Nickel	1 to 200
Copper	1 to 200
Zinc	0,5 to 50
Cadmium	0,5 to 50
Lead	5 to 200

2.2.2 Method C

With a ratio of test portion to extraction solution of 20 to 1 by volume as indicated in 21.2, the concentrations of elements which can be determined by method C vary as indicated in Table 3.

Table 3

Element to be determined	Range of determination (µg/l)
Cobalt	0,5 to 100
Nickel	0,5 to 100
Copper	0,5 to 100
Zinc	0,2 to 50
Cadmium	0,2 to 50
Lead	2 to 200

Lower concentrations may be determined by choosing a higher ratio of test portion to extraction solution. A ratio of 50 to 1 by volume is possible since the organic solvent mixture is only very slightly soluble in water.

With method C, separation of the aqueous and the organic phases is faster. The metal chelates, especially the Cd-chelate, are more stable in the organic solvent mixture.

NOTE 1 When determining total metals, it is necessary to pretreat the sample before analysis (see examples of procedures in Annex A).

NOTE 2 Methods B and C are not applicable when the chemical oxygen demand (COD) of the samples (or diluted samples) is greater than 500 mg/l.