

Atomic Absorption Method Guide

Fe in copper alloys

Key Words

- Copper Alloys
- Iron
- Flame
- Atomic Absorption

Principle

The sample is digested in nitric/hydrochloric acid, and iron is determined by flame atomic absorption spectrometry using an air-acetylene flame. Standard solutions matched for copper content are used to compensate for the interference of copper on iron.

Reagents

Nitric acid (AnalaR grade, concentrated, s.g. 1.42)

Hydrochloric acid (AnalaR grade, concentrated, s.g. 1.18)

Pure copper metal (e.g. BCS reference material number 197f)

Iron master standard (1000mg/L, Spectrosol or equivalent)

Iron sub-stock standard solution (100.0mg/L)

Transfer 10.0mL of iron master standard solution to a 100.0mL volumetric flask, dilute to volume with deionised water.

Working standards

Weigh four 1.00g portions of pure copper into four 100mL volumetric flasks. Add 20.0mL of deionised water and 10.0mL each of nitric and hydrochloric acids. Allow to stand until the copper has dissolved. Add 0, 1.0, 5.0 and 10.0mL of the iron sub-stock standard to the flasks and dilute to volume with deionised water. The working standards will contain 0, 1.0, 5.0 and 10.0mg/L of iron.

Sample Preparation

Weigh 1.000g of copper alloy into a 100mL volumetric flask, add 20.0mL of deionised water and 10.0mL each of nitric and hydrochloric acids. Allow the mixture to stand until the sample has dissolved and dilute to volume with deionised water. 10mg/L in solution is equivalent to 0.1% m/m of iron in the original sample. For higher concentrations, this solution can be diluted with a 1% m/v solution of high purity copper made in the same way.

Instrument Parameters

The screenshot shows the instrument parameter software interface for Fe copper (Fe). The interface is divided into two main sections. The top section contains measurement mode (Absorption), number of resamples (3), fast resamples (checked), measurement time (4.0s), wavelength (248.3nm), lamp current (75%), and bandpass (0.2nm). It also includes options for high resolution, background correction (D2 Quadline), and filter rejection. The bottom section contains flame parameters: flame type (Air-Acetylene), fuel flow (0.9 L/min), burner stabilization time (0 min), nebuliser uptake time (4 s), burner height (7.0 mm), and options for optimising fuel flow and burner height.

Figure 1 Instrument parameters

Results

Sample	BCS 181/2	BCS 182/2	BCS 216/1	BCS262	BCS 263/1	BCS 268
Iron found (% m/m)	0.42	0.46	0.39	0.18	0.36	0.38
Reference value (% m/m)	0.42	0.47	0.40	0.19	0.35	0.39

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The method of sample treatment described in this publication should be performed only by a competent chemist or technician trained in the use of safe techniques in analytical chemistry. Users should acquaint themselves with particular hazards which may be incurred when toxic materials are being analysed and handled in the instruments, and the instrument must be used in accordance with the operating and safety instructions given in the Operators manual.

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