AS 3988—1991

Australian Standard®

Copper, lead, zinc, gold and silver ores—Guide to sample preparation for the determination of gold

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The following interests are represented on Committee MN/5:

- Australian Institute of Mining and Metallurgy
- Australian Lead Development Association
- Australian Mining Industry Council
- CSIRO, Division of Mineral and Process Engineering
- Royal Australian Chemical Institute

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PREFACE

This Standard was prepared by the Standards Australia Committee on Copper, Lead, Zinc, Gold and Silver Ores and Concentrates, under the direction of the Multitechnics Standards Board, as part of its program of standardizing methods for the determination of elements of commercial interest in such materials.

Like any other material, the precision of a given sample preparation method for the determination of gold depends on a number of basic parameters such as concentration, particle size and sample mass. However, an optimum preparation scheme requires further information on the size and spatial distribution of individual gold particles in the gangue, and on whether the gold is alluvial, associated with another mineral, or disseminated in the gangue. Some of these parameters are difficult to measure, but their possible adverse effect can be evaluated by testing the ore in question so that a suitable sample preparation sequence can be specified. It is not possible to define an optimum sample preparation procedure which would be applicable to all ores.

This Standard describes a basic sample preparation procedure, methods for the determination of the precision of sample preparation and testing as a whole and for individual stages, and optional procedures to improve the precision. The achievable precision varies depending on ore type. The test procedure described permits a realistic precision level to be defined for the material in question.

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APPENDICES

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STANDARDS AUSTRALIA

Australian Standard

Copper, lead, zinc, gold and silver ores—Guide to sample preparation for the determination of gold

1 SCOPE This Standard provides guidance on methods for the preparation of samples of gold-bearing ore for the determination of gold content. It also describes procedures for checking and adjusting the precision of sample preparation and testing.

The procedures described are applicable to the preparation of laboratory samples and test portions for chemical analysis from the material delivered to the laboratory. Some aspects of primary sampling such as drill hole sampling and frequency of taking increments from a conveyor belt are not considered.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS	
1152	Test sieves
2850	Chemical analysis—Interlaboratory test programs—For determining precision of analytical method(s)—Guide to the planning and conduct

3 DEFINITIONS For the purpose of this Standard, the following definitions apply:

3.1 Gross sample A quantity of ore consisting of all of the increments or all of the subsamples taken from a lot; also a composite of all of the increments or all of the subsamples after having been reduced in particle size.

3.2 Laboratory sample A sample which is so conditioned that—

(a) it can be sent to a laboratory; or

(b) it can be used as a source for one or more test portions for chemical analysis.

3.3 Nominal top size The size of aperture of the finest sieve (complying with AS 1152) through which a minimum of 95 percent of the mass of the material passes.

3.4 Subsample A quantity of ore, consisting of a number of increments representing all or part of a lot.

3.5 Test portion A quantity of material taken from a laboratory sample or a test sample which is submitted to analysis or testing in its entirety.

3.6 Test sample A quantity of material obtained from a laboratory sample when additional preparation (drying, hygroscopic moisture determination) is needed prior to the selection of one or more test portions.

4 GOLD OCCURRENCE MODE

4.1 Introduction Owing to the particulate nature and low concentration of gold in ores, the effects of size and spatial distribution of gold particles can have a large influence on the precision of sample preparation. The problems have been described in numerous technical reports. A good summary of these has been presented by R.G. Burn*.

The descriptions set out in Clauses 4.2 and 4.3 are intended to highlight the difficulties that may be encountered, particularly when unknown ores are to be treated. In practice, the size and spatial distribution of gold particles are rarely determined and the validity of a given sample preparation scheme is assessed on the basis of testing.

4.2 Gold particle size distribution For any given gold concentration the range of possible individual gold particle sizes (irrespective of whether it is expressed as size distribution, average or maximum particle size) translates into an extremely high range of corresponding ratios expressed as number of gold particles/sample mass. This ratio determines the expected precision of mass division.

Take for example, the case of 1 kg of ore containing 5 g/t of gold:

(a) If the average diameter of the gold particles is 10 µm, the ore contains about half a million gold pieces and the precision of mass division is expected to be good.

(b) Alternatively, the material may contain just one 1 mm nugget and a straightforward mass division would be meaningless.

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* BURN, R.G. Factors affecting the selection of methods of gold analysis. *Mining Magazine,* May 1984, p. 468-475.