Specific Accreditation Guidance

Materials

Characterisation of Metallic Items by X-Ray Fluorescence and Atomic (Arc/Spark) Emission Techniques

August 2018

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Characterisation of Metallic Items by X-Ray Fluorescence and Atomic (Arc/Spark) Emission Techniques

This document serves as guidance and does not include accreditation criteria for facilities conducting characterisation of metallic items by X-ray fluorescence and atomic emission techniques covered by their scope of accreditation.

This document is included as a reference in the NATA Accreditation Criteria (NAC) package for Materials.

General

Use of X-ray fluorescence and atomic (arc/spark) emission technique for characterising metallic items is able to be accredited either as a quantitative or qualitative (sorting) process, depending upon the equipment used. The nature of the corresponding accreditation criteria varies significantly between the two testing approaches.

Operation of equipment and interpretation of the readings obtained using either technique, necessitate involvement of appropriately trained and experienced personnel who:

- have familiarity with the chemical composition of the various material types for which accreditation coverage is sought;
- have an understanding of the requirements and limitations of the method, particularly that some elements are unsuitable for analysis by this method and others give poor responses;
- recognise when alloys are encountered which may not be able to be unambiguously determined, notwithstanding comparison with a certified reference material e.g. stainless steel grade 316L (low carbon grade of 316).

Quantitative testing (laboratory spectrometer)

Accreditation for elemental analysis of metals and alloys using laboratory spectrometers is indicated within scopes of accreditation by a listing of the elements recognised for quantitative analysis.

There are extensive technical requirements for facilities accredited for these techniques, including the need to have implemented an equipment calibration program, documented validation or verification data, method accuracy, measurement uncertainty and to have sufficient certified reference materials to cover the full analytical range of the instrumentation. For further guidance refer to AS 2563 *Wavelength dispersive X-ray fluorescence spectrometers - determination of precision* and AS 2883 *Analysis of metals - Procedures for the setting up, calibration and standardization of atomic emission spectrometers using arc/spark discharge.*

Results of elemental analysis for such testing may be reported within the defined measurement uncertainty values.

It may also be possible to assign a ‘closest match’ among the available grade/alloy options listed within a given material specification. However, no statement can be

made in a report issued under the facility's scope of accreditation which implies that a unique 'match' to a particular alloy or material grade has been obtained.

A further caveat to any statement of 'grade or material 'matching' is also necessary in order to highlight to users of test reports that compliance with mechanical properties, which may be associated with the material specification, cannot be inferred on the basis of spectrometric analysis.

Qualitative testing (portable test units)

Accreditation for qualitative testing, typically involving the use of portable equipment in the field, is indicated within scopes of accreditation by the term 'Comparative indication of material grade and alloy type'.

For this type of testing, the material under test is directly compared with a certified reference material of the required material grade or alloy type and it does not involve use of calibrated spectrometers.

This type of testing is typically for the purposes of 'material sorting' and any reporting of test results should not infer assurance over material composition or grade/alloy type. Rather, it is a process of qualitative comparison with a reference item and results may only be reported under the scope of accreditation where the individual carrying out the testing has available a reference example for the product of interest in order to carry out a side-by-side comparison.

Furthermore, the assessment of compatibility between the sample under test and the reference material can only be based on the elemental values displayed, not the machine 'matching' algorithm which, by its nature, is not straightforward to validate. Therefore, a record of the displayed composition, representing the original data upon which any conclusion is based, is to be retained. However, these elemental values cannot be reported under the scope of accreditation due to the qualitative nature of such measurements (for which establishing the accuracy of the values in absolute terms is not realistic given the nature of variable nature of the test surfaces encountered).

For the reasons outlined above, any test finding is necessarily limited to a statement of 'compatibility' with a nominated material specification. Such statements are to be accompanied by suitable caveats, taking a form similar to the following:

"This statement of compatibility with a material specification is based on qualitative comparison and professional judgement. Certain assumptions regarding the presence and proportion of elements which cannot be detected and/or accurately quantified are inherent to this evaluation. The reported compatibility with a material grade cannot be used to establish compliance or otherwise with any material specification, including any associated mechanical properties."

References

This section lists publications referenced in this document. The year of publication is not included as it is expected that only current versions of the references shall be used.

Standards

AS 2563	Wavelength dispersive X-ray fluorescence spectrometers—Determination of precision
AS 2883	Analysis of metals - Procedures for the setting up, calibration and standardization of atomic emission spectrometers using arc/spark discharge

NATA publications

NATA Accreditation Criteria (NAC) package for Materials

Amendment table

The table below provides a summary of changes made to the document with this issue.

Section or Clause	Amendment
Whole document	Clarification of expectations in relation to reported statements of grade/alloy matching.