INTERNATIONAL STANDARD

ISO 22029

Microbeam analysis — EMSA/MAS standard file format for spectral-data exchange

Analyse par microfaisceaux — Format de fichier standard EMSA/MAS pour échange de données spectrométriques

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 202, *Microbeam analysis*.

This third edition cancels and replaces the second edition (ISO 22029:2012), which has been technically revised.

The main changes are as follows.

— The file encoding in this version has been changed from ASCII to UTF-8. This allows for the use of non-ASCII characters in specified descriptive fields but still maintains backwards compatibility with older data reading and writing software since the ASCII coding is a sub-set of the UTF-8 coding. Most of the keyword value character limits have also been removed in this version. These were originally imposed to aid readability of files output to teletype printers and are no longer deemed a necessary restriction.

— The definition of the #OFFSET keyword has been modified to specify that the value of the first spectral channel is taken from the channel's mid-point.

— A new required keyword, #TIMEZONE, has been added and the #TIME keyword is now explicitly required to be local time to ensure that the time and date the data has been recorded can be unambiguously determined.

— Eight new optional keywords have been added: #ROTATION, #WORKDIST, #CRC32C, ##MNKRESOL, ##SUPPAREA, ##SUPPTHICK, ##SUPPMAT and ##DETPOS.

— The new optional error checking keyword, #CRC32C, has been added to provide a more robust error checking option than the original #CHECKSUM value.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The original EMSA/MAS Standard File Format for Spectral Data Exchange was published in October 1991. Since then, advances in both microbeam analysis techniques and in PC technology have meant that this original standard is not fully able to meet modern requirements. The members of ISO/TC 202 propose this updated version. Every effort has been made to only make those changes that improve or update the applicability of the standard, while minimizing incompatibility with the original version. The remit of TC 202 does not include surface analysis techniques, which are addressed by TC 201, and so references to these techniques have been removed from the original standard where necessary. The original document also included examples of coding and telecommunications protocols. Since these are now largely outdated, and not integral to the formatting of the data, these have also been removed.

It is noted that one of the originating societies (EMSA) has modified its name since the original document was published. The society is now officially known as the Microscopy Society of America (MSA), the term "Electron" having been dropped to more fully indicate the work and interest of the membership of the society in all forms of microscopy.

Microbeam analysis — EMSA/MAS standard file format for spectral-data exchange

1   Scope

This document presents a simple format for the exchange of digital spectral data that has been designated as an EMSA/MAS standard. This format is readable by both humans and computers and is suitable for transmission through various electronic networks, the phone system (with modems) or on physical computer storage devices (such as removable media). The format is not tied to any one computer, programming language or computer operating system. The adoption of a standard format enables different laboratories to freely exchange spectral data, and helps to standardize data analysis software. If equipment manufacturers were to support a common format, the microscopy and microanalysis community would avoid duplicated effort in writing data analysis software.

2   Normative references

There are no normative references in this document.

3   Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4   General considerations

The virtues of a single standard data format have been admirably related by various authors[1],[2],[3],[4]. It would often be convenient, after visiting another laboratory to use a different type of microanalytical spectrometer, to be able to return to one's own laboratory to analyse the data, or for a laboratory to be able to send a spectrum to another group at another location for analysis on their computer. A common format also enables test spectra to be transported between data acquisition systems, in order to compare different data analysis routines, and would give users greater choice of analysis procedure, based on commercial or public-domain software. Most importantly, it offers a method for archiving data that does not rely on the continued availability of a given item of equipment or version of software to remain accessible.

An ideal solution is for the manufacturers to represent data in a standard format, but they are unlikely to agree on this without some direction from their customers (the microanalysis community). Therefore, it is highly desirable for EMSA and MAS to proceed with the adoption of a standard format. Such a format does not preclude any research group or manufacturer from having their own, possibly proprietary, format. Spectral data can be stored internally in any format, as long as there is an option to convert it to the external standard (and vice versa) for the purposes of exchange. A standard format should possess the following attributes.

a)   It should be capable of representing the data exactly (without altering the scientific content).

b)   The format should be simple and easy to use.