

ICS 17.240
CCS A 58



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 139-2008

Replacing GB/T 139-1989

**Standard method for using the ferrous sulfate (Fricke)
dosimeter to measure absorbed dose in water**

使用硫酸亚铁剂量计测量水中吸收剂量的标准方法

(English Translation)

Issued on: September 19, 2008

Implemented on: August 1, 2009

Issued by: Standardization Administration of China

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Foreword

This revised standard adopts ASTM E1026-04 "reference standard using Fricke dosimetry system with standard practice" (in English).

This standard redrafted according to ASTM E1026-04. This standard ASTM E1026-04 technical differences are as follows.

- a) in Chapter 2, "Normative references", for other international standards ASTM E1026-04 referenced have been modified using for our standards, this standard references of these national standards or industry standards instead of the corresponding international standards;
- b) an increase in the "(alternative) procedures Preparation of Fe³⁺ ions using Fe₂O₃ initial solution" in the informative Appendix B Capacity (see Appendix B.2.2.2);
- c) increase the informative appendix "preconditioning and dosimeters reagent solution" (see Appendix C).

For ease of use, according to the Chinese custom for some formatting has been modified.

This standard replaces GB/T 139-1989 "ferrous sulphate dosimeter measurements using standard methods absorbed dose in water." this standard compared with GB/T 139-1989 main changes are as follows.

- Absorbed dose by the scope of 40Gy ~ 400Gy extended to 20Gy ~ 400Gy (see 1989 version 1.2.1; 1.4.1 edition);
- With "Normative References" section instead of the 1989 version of "Reference Standards" chapter relevant content (see the 1989 version of the 2; edition the 2,2.1,2.2,2.3);
- Use the "meaning and purpose" chapter replaces the 1989 edition of the "principle" chapter and relevant content, specifically the use of 12mm outer diameter of the ampoule the lower limit of the dosimeter ray energy requirements (see Chapter 4 of the 1989 edition; of 4, 4.5);
- In the "instruments" chapter, enhanced with cleaning solution dosimeter method (see

this version 6.2.2);

--- In the "instruments" chapter, an increase of dosimeter solution containing plastic containers for processing requirements and methods (see edition 6.3, Note 2);

--- Added "Calibration of dosimetry systems" chapter specific requirements (see Chapter 9 edition);

--- Added "after each measurement, should regularly check the air beam spectrophotometer with" 0 "point" requirements (see Excerpts 10.3.5);

--- Part of the 1989 edition of Appendix D of the temperature correction into standard text edition (see D.1 1989 edition of Appendix D, Excerpts 10.4);

--- Added "at 25 °C irradiation and measurement, product recommended $\epsilon \cdot G$ value. $3.52 \times 10^{-4} \text{ m}^2 \cdot \text{J}^{-1}$ (at 303nm Office) "content (see this edition 10.4.8);

--- Remove the 1989 edition in Appendices C and D.

This standard Annex A, Annex B and Annex C is informative appendix.

The standard proposed by China National Nuclear Corporation.

This standard by the National Standardization Technical Committee of nuclear energy.

This standard was drafted. China Institute of Metrology.

1 Scope

1.1

standard specifies the use of an acidic aqueous solution of ferrous sulfate dosimetry systems for measurement of ionizing radiation absorbed dose in water preparation and test program. This system is also known as Fricke dosimetry system consisting of dosimeters and related analytical instrument components.

1.2

This standard specifies the spectrophotometric determination Fricke dosimeter program.

1.3

This standard applies to gamma-ray, X-ray (bremsstrahlung) and high-energy electron beam absorbed dose measurements.

1.4

This standard applies to the measurement of absorbed dose under the following conditions Fricke dosimeter dose measurement system.

1.4.1

absorbed dose range. 20Gy ~ 400Gy [1].

1.4.2

absorbed dose rate. $\leq 106 \text{ Gy} \cdot \text{s}^{-1}$ [2].

1.4.3

radiation energy. initial photon energy of gamma-ray source should be greater than 0.6MeV; the X-ray (bremsstrahlung), for generating a photon the initial electron energy equal to or greater than 2.0MeV; the electron beam, the initial energy of the electron is not to be less than 8.0MeV (see ICRU34 and 35 reports).

1.4.4

dosimeter irradiation temperature. 10 °C ~ 60 °C.

1.5

standard does not address safety issues associated with its use (if it exists). Users of this standard is responsible for establishing the applicable safety and health Standards, and prior to use to determine the applicable limits.

2 Normative references

The following documents contain provisions which, through reference in this standard and become the standard terms. For dated references, subsequent Amendments (not including errata content) or revisions do not apply to this standard, however, encourage the parties to the agreement are based on research Whether the latest versions of these documents. For undated reference documents, the latest versions apply to this standard.

GB 2637 ampoule

GB/T 15446 doses of radiation processing of academic language GB/T 15447 X, conversion method gamma-ray and electron beam radiation absorbed doses of different materials GB/T 16509 doses of radiation processing of Measurement Uncertainty guidelines (GB/T 16509-2008, ISO/ASTM51707.

2005, IDT)

GB/T 16510 radiation absorbed dose calibration laboratory processing capacity requirements (GB/T 16510-2008, ISO/ASTM51400.

2002, IDT)

Selection and calibration of the guide GB/T 16640 dosimetry systems for radiation processing is (GB/T 16640-2008, ISO/ASTM51261.

2002, IDT)

JJG682 double beam UV-Vis spectrophotometer JJG689 ultraviolet, visible, near infrared spectrophotometer ASTM E668 using thermoluminescence (TLD) dosimetry systems for electronic equipment to determine the absorbed dose of radiation damage test in practice ICRU Report No. 34 pulse radiation dosimetry ICRU Report No. 35 of the initial energy of 1MeV ~ 50MeV electron beam radiation dosimetry ICRU Report No. 60 of ionizing radiation and the amount of the basic unit ICRU Report No. 64 of absorbed dose to water standards-based high-energy photon beam dosimetry PIRS-0815 IRSFricke dosimetry system