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**Radon and its offspring individual dose monitoring method
(English Translation)**

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

Drafting organizations of this standard. Institute of Radiation Protection and Nuclear Safety Medicine, Chinese Center for Disease Control and Prevention, Beijing Chemical Occupational Longjiang Provincial Center for Disease Control and Prevention, Institute of Radiation Medicine, Chinese Academy of Medical Sciences, Hubei Provincial Center for Disease Control and Prevention.

1 Scope

This standard specifies methods for monitoring personal internal radiation doses caused by radon and its progeny using solid nuclear track detection technology.

This standard is applicable to the personal internal radiation dose monitoring caused by radon and its progeny by workers in workplaces such as uranium mines, non-uranium

mines and underground culverts.

Measurement.

2 Normative references

The following documents are indispensable for the application of this standard. For dated reference documents, only the dated version applies to this document.

For undated references, the latest version (including all amendments) applies to this document.

GBZ 129 Specifications for personal monitoring of occupational internal exposure

3 Terms and definitions

The following terms and definitions apply to this document.

Radon

The main isotopes of chemical elements with atomic number 86 are ^{222}Rn , ^{220}Rn , and ^{219}Rn .

Note: The radon in this standard only refers to ^{222}Rn .

Radon exposure

In a certain period of time, the total amount of radon that enters the body through air exposure.

Note: The International System of Units (SI) unit is beque-hours per cubic meter.

Solid state nuclear track detection Charged particle detection based on the phenomenon that when charged particles pass through an insulating medium, they will cause atomic-scale radiation damage along their tracks method. If the damage density is high enough, it is processed by chemical etching and other methods, and it can be observed with an ordinary microscope.

CR-39

The scientific name of CR-39 is carbon propylene acetic acid, or allyl diethylene glycol carbonate.

Note: It was discovered by a chemist from Columbia Corporation of the United States. It is the No. 39 material in a series of polymers developed by the US Air Force, so it is commonly known as CR-39.

Chemical etching

The radiation damage of solid nuclear track detectors is etched by chemical reagents to

form observable tracks.

Radon personal dosimeter an appliance that can be worn on an individual to monitor the internal radiation dose caused by radon and its progeny.

Note: This standard specifically refers to a dosimeter composed of CR-39 components and a passive diffusion radon collection cup (box).

Balance factor; F

The ratio of the equilibrium equivalent concentration of radon to the actual concentration of radon.

Note: Equilibrium equivalent concentration refers to the concentration of radon activity when radon and its short-lived daughters are in equilibrium and have the same alpha potential concentration as the actual non-equilibrium mixture.

degree.

Follow up dosimeter

It is used to measure radon exposure in non-professional workplaces during the same period, including the dosimeter mailing process. It is necessary to monitor the personal dose of radon and its descendants to deduct.

4 Monitoring principles

4.1

When the personal radon dose caused by occupational reasons may exceed 2 mSv/a, routine monitoring of the personal radon dose should be carried out. Under normal circumstances, it can be combined with on-site active measurement results and working conditions to determine whether it may exceed 2 mSv/a.

4.2

The personal dose monitoring cycle of radon and its progeny refers to the requirements of GBZ 129, and factors such as the sensitivity of the monitoring method should be considered. Monitoring records, Reports and files should meet the requirements of GBZ 129.

5.1 Measurement system composition

5.1.1

The personal dose measurement system for radon and its progeny is mainly composed of a radon personal dosimeter, a chemical etching device and a track reading system.

5.1.2

The radon collection cup (box) of the radon personal dosimeter should be made of conductive plastic, and a radon collection chamber of appropriate size should be set aside.

Set a wearing pin (clip) for easy wearing and use. Refer to Appendix A for the schematic diagram of the radon personal dosimeter.

5.1.3

The chemical etching device consists of a constant temperature water bath, a temperature control system, an etching rack and an etching rack container.

5.1.4

The track readout system consists of an optical microscope and an adapted image analysis system.

5.2 Measurement system performance requirements

5.2.2

The personal radon dosimeter should have a waterproof function and be able to prevent air dust and radon progeny from entering the dosimeter.

5.2.3

During the chemical etching process, the temperature and concentration of the etching solution should be kept relatively constant, the temperature range is 60 °C ~ 80 °C, the relative deviation is ± 1 °C. Etching conditions need to be optimized. Orthogonal experiments can usually be used to determine the concentration of etchant, etching time, and etching temperature.

number. For CR-39 components, the typical commonly used chemical etching conditions are sodium hydroxide (NaOH) aqueous solution, 10 h etching, the engraving temperature is 70 °C, or potassium hydroxide (KOH) aqueous solution, for 7 h etching, the etching temperature is 70 °C.

5.2.4

Since the standard deviation of track density is related to the measured area and total track count, the actual measured area should not be less than 0.2 cm², and the readout system is required to perform accurate quantitative analysis on the total track number.

5.2.5

The measurement system should be verified or calibrated by a corresponding authorized metrology department.