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

GB/T 46693-2025

**Method for the determination of the isotopic composition and
concentration of dissolved noble gases in water**

水中溶解性稀有气体同位素组成及含量测定方法

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed

and is under the jurisdiction of the National Nuclear Energy Standardization Technical Committee (SAC/TC58). This document was drafted by: Beijing Research Institute of Geology, Nuclear Industry; Institute of Standardization, Nuclear Industry; and the 718th Research Institute of China Shipbuilding Industry Corporation. Institute of Nuclear Physics and Chemistry, China Academy of Engineering Physics; Institute of Mineral Resources, Chinese Academy of Geological Sciences; Institute of Qinghai-Tibet Plateau Research, Chinese Academy of Sciences Plateau Research Institute, Institute of Geology, China Earthquake Administration, National Institute of Metrology, National Nuclear Security Technology Center, CNNC Wuhan Nuclear Power Operation Division China Petroleum & Chemical Corporation Limited, China Petroleum Science and Technology Research Institute Co., Ltd. The main drafters of this document are. Liu Hanbin, Li Junjie, Wang Xinyu, Dong Fangfang, Zhang Jianfeng, Xiu Xiaoqian, Qin Mingkuan, Zhao Ying, and Yang Tianli. Li Yanhe, Lai Qingzhou, Zheng Dewen, Lu Hai, Wu Zhaohui, Liu Dawei, Tao Xiaowan, Zhang Jia, Han Juan, Jin Guishan, Shi Xiao, Shi Yajing. Composition and content of dissolved rare gas isotopes in water Determination methods

1 Scope

GB/T 46693-2025 is the Chinese national standard covering measuring helium, neon, argon, krypton and xenon dissolved in water - the sampling that must not let a bubble in, the extraction and the mass spectrometry, and the isotope ratios that date groundwater and reveal what it has been in contact with. First edition, in force from 1 May 2026. Issued on 31 October 2025, it has been in force since 1 May 2026.

This document describes the isotopic composition and abundance of the rare gases dissolved in water. helium (He), neon (Ne), argon (Ar), krypton (Kr), and xenon (Xe). Measurement method. This document applies to the determination of the composition and content of dissolved rare gas isotopes in water within the nuclear energy field, such as in nuclear reactor cooling circulating water. Hydrogeochemical samples of uranium resources, including unconfined and confined water. Methods for determining the composition and content of dissolved rare gas isotopes in other types of water. Follow the instructions.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included. For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies. This document.

GB/T 5231 Grades and Chemical Compositions of Processed Copper and Copper Alloys

GB/T 6682 Specifications and test methods for water used in analytical laboratories

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 air-saturated water Grade III purity water that has dissolved air to reach saturation.

3.2 During the mass spectrometer test of isotopes, the isotope to be tested is ionized and reaches the electrical signal value detected by the detector.

3.3 The ratio of the true value to the measured value of the isotopic composition of the standard sample/standard substance.

Note. Mass discrimination refers to the difference in response of a mass spectrometer detection system to ions with different mass-to-charge ratios.

4 Reagents or materials

4.1 Grade III purity water, with purity conforming to GB/T 6682, is used for the preparation of air-saturated water. 4.2 3Å molecular sieve, zeolite material. 4.3 5Å molecular sieve, zeolite material.

4.4 Granular activated carbon (particle size 2mm~3mm).

4.5 Getter, Zr-Al alloy (84% Zr mass fraction, 16% Al mass fraction), used to adsorb and remove gases other than rare gases.

4.6 Heating belt, used for heating the sample pretreatment system to accelerate the removal of residual gases adsorbed on the inner wall of the vacuum pipe.