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

GB/T 13372-2025

Replacing GB/T 11845-1989

**Determination of trace elements in uranium dioxide powder and
pellets - Inductively coupled plasma emission spectrometry**

二氧化铀粉末和芯块中杂质元素测定 电感耦合等离子体原子发射光谱法

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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. This document supersedes GB/T 11845-1989 "Determination of Tungsten in Uranium Dioxide Powder and Chips - Spectrophotometric Method" and GB/T 13371- 1992 "Determination of Copper, Iron, Nickel, Magnesium, Manganese, Zinc and Silver in Uranium Dioxide Powder and Chips - Atomic Absorption Spectrophotometry", GB/T 13372- 1992 "Determination of Impurity Elements in Uranium Dioxide Powder and Chips by ICP-AES" Compared with GB/T 13372-1992, except for structural adjustments Aside from editorial changes, the main technical changes are as follows:

---The determination of elements silver, boron, barium, bismuth, indium, and tungsten has been added (see Table 1);

---The measurement range for impurity elements has been changed (see Table 1, 1992 edition);

---Added standard curve plotting (see 8.4.1);

---A test report has been added (see Chapter 11). 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: China Nuclear Fuel Element Co., Ltd., China Institute of Atomic Energy, and China Nuclear Power Research and Design Institute. China National Nuclear Northern Nuclear Fuel Element Co., Ltd., and Sichuan Honghua Industrial Co., Ltd. The main drafters of this document are. Liao Hang, Zhao Shengyang, Chen Changyou, Xu Zi'an, Bai Xue, Zhang Jiansheng, Chen Xuexu, Guo Jinxuan, Fan Min, and Han Shuzhen. Ji Pengbo, Yuan Yulong, and Long Gaoxu. The release history of this document and the document it replaces is as follows:

---First published in 1989 as GB/T 11845-1989, and first published in 1992 as GB/T 13371-1992. Published as GB/T 13372-1992;

---This is the first revision. Determination of impurity elements in uranium dioxide powder and pellets Inductively Coupled Plasma Atomic Emission Spectrometry

1 Scope

GB/T 13372-2025 is the Chinese national standard on determination of trace elements in uranium dioxide powder and pellets - inductively coupled plasma emission spectrometry, in the field of energy and heat transfer engineering. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 5 October 2025 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 5 October 2025. Classification: ICS 27.120, CCS F46. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document describes the determination of 22 elements, including silver, aluminum, and boron, in uranium dioxide powder and pellet powder using inductively coupled plasma atomic emission spectrometry (ICP-AES). Reagents or materials, instruments and equipment, samples, test procedures, test result processing, precision and test reports for impurity elements. This document applies to the determination of 22 impurity elements, including silver, aluminum, and boron, in uranium dioxide powder and pellets. The sample size is

0.3 g. Each element is measured... The range of quantities is shown in Table 1. Table

1.0 B, Ag, Cd 0 0.0050 0.010 0.020 0.050 0.10

5.10 CL-TBP extraction resin, containing 60% tributyl phosphate, with a particle size of 0.125mm~0.193mm.

2 Normative references

This document has no normative references.

3 Terms and Definitions

This document does not contain any terms or definitions that need to be defined.

4.Principles After the sample is dissolved in nitric acid and hydrofluoric acid, it is extracted with CL-TBP resin in a 3 mol/L nitric acid medium to allow the analyte impurities to react with the analyte. Uranium matrix separation was performed, and the impurity eluent was collected. The intensity of characteristic spectral lines of the impurity elements was measured using inductively coupled plasma atomic emission spectrometry (ICP-AES), and the results were analyzed by concentration analysis. The impurity element content in the sample was calculated using the standard curve of intensity-spectral line signal.

5.Reagents or materials Unless otherwise stated, all reagents used in this document are of superior purity and conform to national or industry standards, and the water used is of high conductivity. Deionized water with a strength of $\leq$

0.10 mS/m at 25°C.

5.1 Mannitol, analytical grade.

5.2 Nitric acid (HNO₃), $\rho=1.42\text{g/cm}^3$.

5.3 Hydrochloric acid (HCl), $\rho=1.19\text{g/cm}^3$.

5.4 Hydrofluoric acid (HF), $\rho=1.13\text{g/cm}^3$.

5.5 Hydrogen peroxide (H₂O₂), mass fraction greater than 30%.

5.6 Nitric acid solution, $c(\text{HNO}_3) = 3 \text{ mol/L}$. Prepared with nitric acid (5.2) and water.

5.7 Mannitol solution, $\rho(\text{mannitol}) = 10 \text{ mg/mL}$. Prepared with mannitol (5.1) and water.

5.8 Single-element standard stock solutions, standard samples/standard substances.

5.9 A mixed series of standard solutions, prepared from single-element standard stock solutions (5.8) and nitric acid solution (5.6), comprising the mixed series of standard solutions (N1, N2,...). The concentrations of each element in N3, N4, and N5 are shown in Table 2. Table

2 Mixed series of standard solutions The unit is micrograms per milliliter. Elements N0 N1
N2 N3 N4 N