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Replacing GB 8921-1988

Limit standards for ^{226}Ra in phosphate fertilizer and its compound fertilizer

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Foreword

Chapter 4, Section 5.1, and Chapter 6 in this Standard are compulsory; the rest are recommendatory.

This Standard was drafted according to the rules given by GB/T 1.1-2009.

This Standard replaces GB 8921-1988 *Limit standards for ^{226}Ra in phosphate fertilizer and its compound fertilizer*. Compared with GB 8921-1988, the modifications of this Standard mainly include:

- The applicable scope is expanded from phosphate fertilizer to phosphate fertilizer and its compound fertilizer;
- This revision reserves the GB 8921-1988's limit requirements of ^{226}Ra in phosphate fertilizer; and deletes the requirements to phosphate ore.
- Provide the methods of sample collection and preparation in the form of Annex; and add the method of analyzing ^{226}Ra with γ energy spectrum.

This Standard was proposed and shall be centralized by the Ministry of Health of the People's Republic of China.

This Standard shall be interpreted by the Ministry of Health of the People's Republic of China.

Drafting organization of this Standard: Health Supervision Institute of Jinlin Health Department.

Main drafters of this Standard: Yan Chuang, Sun Wuchang, Li Tao, Shi Yan, An Fucui, Piao Yongde, and Wang Kexin.

The previous version replaced by this Standard is:

- GB 8921-1988.

Limit standards for ^{226}Ra in phosphate fertilizer and its compound fertilizer

1. Scope

This Standard stipulates the ^{226}Ra 's limited indicators in phosphate fertilizer and its compound fertilizer (hereafter abbreviated as phosphate fertilizer), as well as the corresponding sampling, inspection requirements, and the result judgment.

This Standard applies to the agricultural (including vegetables, fruits and other food crops) phosphate fertilizer.

2. Normative references

The articles contained in the following documents have become part of this document when they are quoted herein. For the dated documents so quoted, all the modifications (including all corrections) or revisions made thereafter shall be applicable to this document.

GB 11713 Standard methods of analyzing low specific gamma radioactivity samples by semiconductor gamma spectrometers

GB 11743 Determination of radionuclides in soil by gamma spectrometry

3. Terms and definitions

For the purpose of this Standard, the following terms and definitions shall apply.

3.1

Phosphate fertilizer

It is a kind of chemical fertilizer, of which phosphorus is the unique nutrient element.

3.2

Compound phosphate fertilizer

It is a kind of chemical fertilizer containing phosphorus and other nutrient elements (such as nitrogen and potassium).

4. ^{226}Ra limit in phosphate fertilizer and its compound fertilizer

^{226}Ra content in phosphate fertilizer and its compound fertilizer shall not be higher than $500 \text{ Bq}\cdot\text{kg}^{-1}$.

5. Inspection requirements

5.1 The quality inspection department of manufacturer shall conduct sample collection once a year; collect the samples when the production process or raw materials or mix proportion are changed; and send to the qualified testing agency for inspection.

5.2 The collection and preparation of samples of phosphate fertilizer and its compound fertilizer shall be carried out according to the method given in Annex A.

5.3 The measurement and arbitration of ^{226}Ra content in phosphate fertilizer and its compound fertilizer shall be conducted according to emanation scintillation method given in Annex B.

5.4 The measurement of ^{226}Ra content in phosphate fertilizer and its compound fertilizer shall be conducted according to γ energy spectrum method given in GB 11713 and GB 11743.

6. Result judgment

If the ^{226}Ra content in phosphate fertilizer is tested to be less than $500 \text{ Bq}\cdot\text{kg}^{-1}$, it is deemed as qualified. If the ^{226}Ra content in phosphate fertilizer is tested to be more than $500 \text{ Bq}\cdot\text{kg}^{-1}$, it shall re-collect the test samples; if the retest result still exceeds $500 \text{ Bq}\cdot\text{kg}^{-1}$, it is deemed as unqualified.

Accurately weigh 1.00g of sample; put it into the nickel crucible; add 2 - 4 g of anhydrous sodium carbonate and 6g of sodium peroxide; stir evenly; then uniformly cover a layer of about 3g of sodium peroxide. Put the crucible into 650-700°C muffle furnace; melt it for 7-8 minutes; when the melt is in red fluid, take it out and slightly cool it.

B.4.2 Extraction

Put the outer wall of crucible into cold water for "decladding"; then put it into a 500 ml beaker; extract it with 200 ml of hot distilled water; after the end of violent reaction, clean up the crucible with a bit amount of dilute hydrochloric acid; then thoroughly rinse the crucible and watch glass with distilled water; add 3 ml of 0.02 mol barium nitrate solution; and heat it to nearly-boiling; then take it down.

B.4.3 Separation

Filter the above solution on the quantitative filter paper; use 0.1 mol sodium carbonate solution to wash and precipitate for three times; use distilled water to wash one time; discard the filtrate.

B.4.4 Dissolution and sample sealing

Dissolve the sediment in a 50ml beaker with 3 mol mixed liquor of hydrochloric acid and small amount of citric acid; transfer the solution into a 100 ml diffuser; use hot distilled water to wash the filter paper to be without-yellow; control the total amount of solution to be about 35 ml; exhaust the air with vacuum pump for 5 minutes; then seal it for a week; and record the sealing time.

B.4.5 Gas pushing

Connect the scintillation chamber that has been vacuumed and of which the background level has been measured, the drying tube, the diffuser filled with sample solution, the activated carbon tube, and bubbling tube according to the Figure B.1. Firstly, open the head of scintillation chamber and diffuser at the beginning of gas pushing; then slowly open the glass head of active carbon tubes; control the air velocity to be about 120 bubbles/minutes; then speed up the air supply rate; control the air supply time to be within 15 minutes.

B.4.6 Measurement

After gas pushing, leave the scintillation chamber alone for 3 hours; then carry out three times of measurement under the selected good operating condition, 10 minutes for each time.

B.4.7 Exhaust

After measurement, immediately use vacuum pump to eliminate radon gas and its daughter elements, and wash it with nitrogen; make the scintillation chamber recover to

I_{standard} — Net counting rate of measured ^{226}Ra standard solution, unit: count/min.

B.5.2 Calculation of ^{226}Ra content in test sample

^{226}Ra content c_{Ra} ($\text{Bq}\cdot\text{kg}^{-1}$) in test sample shall be calculated according to Formula (B.2):

$$c_{\text{Ra}} = K \cdot I / m(1 - e^{-\lambda t}) \quad \text{..... (B.1)}$$

Where:

c_{Ra} — ^{226}Ra content in test sample, unit: $\text{Bq}\cdot\text{kg}^{-1}$;

K — Conversion coefficient of scintillation chamber, the ^{226}Ra Bq number of device responding to 1 count/min, unit: $\text{Bq}\cdot\text{min}/\text{count}$;

I — Net counting rate of measured test sample, unit: count/min;

m — weight of measured test sample, unit: kg;

λ — Decay constant of radon, unit: every day(d^{-1});

t — Cumulative time of radon, unit: day (d).

B.6 Precision

The difference between two parallel test results shall not be greater than 20%.

_____ **END** _____

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