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

GB/T 10656-2022

Replacing GB/T 10656-2008

**Analysis of water used in boiler and cooling system -
Determination of zinc**

锅炉用水和冷却水分析方法 锌离子的测定

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1 Scope

GB/T 10656-2022 is the Chinese national standard on analysis of water used in boiler and cooling system - determination of zinc, in the field of environment and health protection, safety. 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 9 March 2022 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 October 2022. Classification: ICS 13.060.50, CCS G76. 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 zinc in water used in boiler and cooling system. This document applies to the determination of zinc content ranging from

0.2 mg/L to

5.0 mg/L in water used in boiler and circulating cooling system.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 601, Chemical reagent - Preparations of reference titration solutions

GB/T 602, Chemical reagent - Preparations of standard solutions for impurity

GB/T 603, Chemical reagent - Preparations of reagent solutions for use in test methods

GB/T 6682-2008, Water for analytical laboratory use - Specification and test methods

HG/T 4015, General Reagent - General method for the determination of pH ranges corresponding the colour transition of acid-base indicators

3 Terms and definitions

There are no terms and definitions that need to be defined in this document.

4 General

Caution - The strong acid and strong base which are used in this document are corrosive. Avoid inhalation or contact with the skin during use. If it splashes on the body, use plenty of water to rinse immediately, and if it is serious, seek medical attention immediately. The reagents and water used in this document, unless otherwise specified, shall be analytical reagents and above, and grade-3 water specified in GB/T 6682-2008. The reference titration solutions, impurity reference solutions, reagents and products required in the test shall be prepared in accordance with the provisions of GB/T 601, GB/T 602 and GB/T 603 unless other provisions are specified.

5 Zincon spectrophotometry

5.1 Method summary In the solution of pH8.5 ~ pH9.5, the zinc reagent and zinc ion form a blue complex; at the wavelength of 620 nm, use the spectrophotometric method to measure its absorbance.

5.2 Reagents or materials

5.2.1 Hydrochloric acid solution: 1+1.

5.2.2 Sulfuric acid solution: 1+35.

5.2.3 Sodium hydroxide solution: 40 g/L.

5.2.4 Ammonium persulfate solution: 4 g/L, ready-to-use.

5.2.5 Boric acid-potassium chloride-sodium hydroxide buffer solution (pH8.8 ~ pH9.0). Prepare according to HG/T 4015.

5.2.6 Zinc standard stock solution:

0.1 mg/mL. Prepare according to GB/T 602, or buy commercially available solution.

5.2.7 Zinc standard solution:

0.01 mg/mL. Pipette

10.00 mL of zinc standard stock solution into a 100 mL volumetric flask; use water to dilute to the mark; mix well. Formulate the solution when needed.

5.2.8 Methyl orange indicator solution: 1 g/L.

5.2.9 Zinc reagent solution:

0.8 g/L. Weigh

0.2 g of zinc reagent and dissolve it in 250 mL of absolute ethanol; cover and place overnight to make it completely dissolved (or ultrasonically shake for 1 min ~ 5 min to dissolve completely). Store the solution in a brown bottle and place it in a refrigerator at 0 °C ~ 4 °C for one month. When the solution turns from red to yellow, it shall be re-prepared.

5.4 Test procedures

6.2.7 Acetic acid-sodium acetate buffer solution (pH = 5.5): Weigh 200 g of sodium acetate ($\text{CH}_3\text{COONa} \cdot 3\text{H}_2\text{O}$) and dissolve it in 150 mL of water; add 9 mL of glacial acetic acid; transfer it into a 1 000 mL volumetric flask; use water to dilute to the mark.

6.2.8 Ethylene Diamine Tetraacetic Acid standard titration solution: $c(\text{EDTA}) =$

0.001 mol/L. Before use, use boiled and cooled water to dilute the Ethylene Diamine Tetraacetic Acid standard titration solution, of a concentration of

0.1 mol/L, which is prepared according to GB/T 601.

6.2.9 Xylenol orange indicator solution: 6 g/L. Weigh

0.6 g of xylenol orange; dissolve in water and dilute to 100 mL; mix well; store in a brown bottle.

6.3 Apparatus Micro burette: 5 mL or 10 mL.

6.4 Preparation of samples The sample for the single-item analysis measurement shall not be less than 300 mL; the sample storage bottle shall be a stoppered glass bottle or a polyethylene plastic bottle. The determination of zinc content should be completed as soon as possible. Under normal circumstances, the sample shall not be stored for more than 24 h. For the measurement of the content of soluble zinc, an appropriate amount of sample shall be determined after filtration through the medium-speed filter paper.

6.5 Test procedure Pipette 100.0 mL of sample; put it in a 250 mL conical flask; add 2 mL of tartaric acid solution, 4 mL of potassium fluoride solution and

0.5 mL of thiourea solution; use sodium hydroxide solution or hydrochloric acid solution to

adjust the pH of the test solution to 5 ~ 6. Then, add 20 mL of acetic acid-sodium acetate buffer solution; shake well; heat to 30 °C ~ 40 °C on an electric hot plate or water bath. Add 10 drops of trisodium citrate solution; then, add three to four drops of xylene orange indicator solution; use Ethylene Diamine Tetraacetic Acid standard titration solution to titrate until the sample changes from purple red to bright yellow as the end point. When there is no organic phosphonate in the sample, tartaric acid solution may not be added; when there is no copper ion, thiourea solution may not be added; when the content of aluminum ion and iron ion is less than 1 mg/L, trisodium citrate solution may not be added.