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Determination of scale inhibition performance of water treatment chemicals - Calcium carbonate precipitation method

水处理剂除垢性能的测定 碳酸钙沉积法

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Standardization Administration of the People's Republic of China.

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Determination of scale inhibition performance of water treatment chemicals - Calcium carbonate precipitation method

1 Scope

This Standard specifies the determination of scale inhibition performance of water treatment chemicals to inhibit calcium carbonate precipitation -- calcium carbonate precipitation method.

This Standard applies to the evaluation of the scale inhibition performance of water treatment chemicals to inhibit calcium carbonate precipitation under the same conditions in the circulating cooling water system; it also applies to the screening of the water treatment chemicals to inhibit calcium carbonate scale formulation.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

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

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

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

3 Method summary

Use water for actual working conditions, or prepared water that contains a certain amount of bicarbonate radical and calcium ions AND water treatment chemicals to prepare into the test solution. Under heating conditions, promote the accelerated decomposition of calcium bicarbonate into calcium carbonate. After reaching the equilibrium, determine the calcium ion concentration in the test solution. The larger the calcium ion concentration, the better the scale inhibition performance of the water treatment chemicals.

V -- the value of the volume of the taken sodium bicarbonate standard solution, in milliliters (mL) (V = 5).

4.5 Calcium chloride standard solution: 1 mL contains about 6.0 mg of Ca^{2+}; prepare and calibrate according to the following steps:

a) Preparation: weigh 16.7 g of anhydrous calcium chloride into a 100 mL beaker; use water to dissolve it; transfer all to a 1 000 mL volumetric flask; use water to dilute to the mark; shake well.

b) Calibration: pipette 2.00 mL of calcium chloride standard solution into a 250 mL conical flask; add about 80 mL of water, 5 mL of potassium hydroxide solution and about 0.1 g of calcium-carboxylic acid indicator; use Ethylene Diamine Tetraacetic Acid standard titration solution to titrate until the solution turns from purple-red to bright blue as the end point.

c) Calculation: calculate the content of calcium ion (Ca^{2+}) by mass concentration ρ_2, according to Formula (2):

$$\rho_2 = \frac{V_1 c M}{V} \qquad \cdots\cdots (2)$$

Where:

ρ_2 -- the mass concentration of calcium ion (Ca^{2+}), in milligrams per milliliter (mg/mL);

V_1 -- the value of the volume of Ethylene Diamine Tetraacetic Acid standard titration solution that is consumed in the titration, in milliliters (mL);

c -- the exact value of the actual concentration of Ethylene Diamine Tetraacetic Acid standard titration solution, in moles per liter (mol/L);

M -- the value of the molar mass of calcium ion (Ca^{2+}), in grams per mole (g/mol) (M = 40.08);

V -- the value of the volume of the taken calcium chloride standard solution, in milliliters (mL) (V = 2).

4.6 Hydrochloric acid standard titration solution: c(HCl) is about 0.1 mol/L.

4.7 Ethylene Diamine Tetraacetic Acid standard titration solution: c (EDTA) is about 0.01 mol/L.

4.8 Bromocresol green-methyl red indicator solution

4.9 Calcium-carboxylic acid indicator: weigh 0.2 g of calcium-carboxylic acid indicator [2-hydroxy-1(2-hydroxy-4-sulfo-1-naphthalenazo)-3-naphthoic acid]

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