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Plate-type DeNO_x catalysts

平板式烟气脱硝催化剂

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Foreword

This Standard is drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard is proposed by China Petroleum and Chemical Industry Association.

This Standard is under the jurisdiction of National Standardization Technical Committee of Chemical (SAC/TC 63).

Drafting organizations of this Standard: Datang Nanjing Environmental Protection Technology Co., Ltd., Guodian Environmental Protection Research Institute, Xi'an Thermal Power Research Institute Co., Ltd., Zhejiang Tuna Environmental Protection Technology Co., Ltd., Research Institute of NCIG.

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Plate-type DeNO_x catalysts

1 Scope

This Standard specifies the terms and definitions, product specifications, requirements, test methods, inspection rules, marking, packaging, transportation and storage, product accompanying documents of plate-type flue gas DeNO_x catalysts.

This Standard is applicable for vanadium and titanium NH₃ selective catalytic reduction plate-type flue gas DeNO_x catalyst.

2 Normative references

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

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 19587 Determination of the specific surface area of solids by gas adsorption using the BET method

GB/T 21650.1 Pore size distribution and porosity of solid materials by mercury porosimetry and gas adsorption - Part 1: Mercury porosimetry

GB/T 31590 Analytical method of chemical composition of flue gas DeNO_x catalysts

3 Terms and definitions

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

3.1

plate-type catalysts

DeNO_x catalysts obtained by roasting after coating the active material on the surface thereof with metal meshes as the base material.

3.2

NH₃ selective catalytic reduction

DeNO_x method that the ammonia reducing agent reacts with the nitrogen oxides to

produce nitrogen and water under the action of the catalyst.

3.3

plate

Catalyst plate formed by metal meshes with the surface evenly coated with active components, folded and sheared according to a certain specification, which is the basic component of plate-type catalysts.

3.4

element

Assembled by a certain number of catalyst plates in a metal box.

3.5

module

Assembled by a certain number of catalyst elements in a module box.

3.6

pitch

Distance between the center layer of two adjacent plates in the catalyst element.

3.7

geometrical specific surface area

The ratio of the total surface area of the catalyst channel for flue gas circulation to the catalyst volume.

3.8

opening ratio

The ratio of the cross-sectional area of the catalyst channel for flue gas circulation to the total cross-sectional area of the catalyst.

3.9

abrasion resistance

Ability of the active material coating on the surface to resist frictional force without forming debris or powder when the plate-type catalyst is rubbed by external forces.

6.3.1.1.3 Electronic balance: accurate to 0.0001 g.

6.3.1.1.4 Drying oven (dryer).

6.3.1.1.5 Cutting machine.

6.3.1.1.6 Cone drill: with drill diameter of 8 mm.

6.3.1.2 Preparation of sample

USE a cutting machine to cut the sample with a length and width of 90 mm (excluding the corrugated part) and smooth surface; USE a cone drill to drill holes at the center of the sample. PLACE the sample after drilling into the oven; DRY at 60 °C for 30 min; REMOVE the sample and PLACE it in the dryer for 30 min; SEAL and WEIGH. For further use.

6.3.1.3 Determination procedure

FIX the sample in an abrasion tester at ambient temperature of 10 °C to 30 °C and a relative humidity of 15 % to 75 %. The distance between the dust suction pipe and the sample is 6 mm ± 0.5 mm, and the diameter of the dust suction pipe is 7.5 mm ± 0.5 mm.

During test, use rubber wheels with a hardness of 90HA ± 5 HA and a width of 13 mm ± 1 mm. The additional weight of the single grinding wheel is 750 g (the total weight of the single grinding wheel and the total weight of the weight arm is 1.0 kg). The grinding wheel speed is 60 r/min, and the number of revolutions is 300 r.

After grinding, PLACE the sample once again in the oven, DRY at 60 °C for 30 min, and then PLACE the sample in the dryer for 30 min, SEAL and WEIGH.

6.3.1.4 Calculation of results

The abrasion resistance ζ_p of catalysts is expressed in milligrams per 100 revolutions (mg/100 r), and calculated according to equation (3):

$$\zeta_p = \frac{2(m_1 - m_2)}{n} \times 100 \quad \dots\dots\dots (3)$$

where:

m_1 - the mass of the sample before test, in milligrams (mg);

m_2 - the mass of the sample after test, in milligrams (mg);

n - the number of revolutions of the grinding wheel ($n = 300$ r).

6.4.2.5 Test

6.4.2.5.1 Determination of activity

After the completion of the aging, access all the gases according to the test requirements in Table 4, stabilize and maintain for 1 h. DETERMINE the concentration of NO_x in the inlet and outlet of the reactor once every 1 h. When the results of 4 consecutive determinations do not have the same trend and the relative deviation is less than 3 %, the NO_x concentration test is completed. The arithmetic mean of the results of 4 consecutive determinations is taken as the measurement result.

6.4.2.5.2 Determination of SO_2/SO_3 conversion rate

After the completion of the activity determination, cut off the NH_3 supply, and other flue gas conditions remain unchanged, stabilize and maintain for 1 h. DETERMINE the volume fraction of SO_3 in the inlet and outlet of the reactor and the volume fraction of SO_2 in the inlet of the reactor once every 1.0 h. When the results of 4 consecutive determinations do not have the same trend and the relative deviation is less than 10 %, the SO_2/SO_3 conversion rate test is completed. The arithmetic mean of the results of 4 consecutive determinations is taken as the measurement result.

6.4.3 Result calculation

6.4.3.1 Denitrification efficiency

The denitrification efficiency η of catalysts is calculated according to equation (4):

$$\eta = \frac{C_1 - C_2}{C_1} \times 100\% \quad \dots\dots\dots (4)$$

where:

C_1 - the concentration of NO_x (standard state, dry basis) in reactor inlet, in milligrams per cubic meter (mg/m^3);

C_2 - the concentration of NO_x (standard state, dry basis) in reactor outlet, in milligrams per cubic meter (mg/m^3).

6.4.3.2 Activity

When the NH_3/NO_x molar ratio is equal to 1, the activity K of catalysts is expressed in meters per hour (m/h), and calculated according to equation (5):

$$K = -AV \times \ln(1 - \eta) \quad \dots\dots\dots (5)$$

7.2.2 Sampling and determination rules

7.2.2.1 Sampling rules

For plate-type DeNO_x catalysts, each item is taken as a delivery batch, and catalysts of not more than 150 m³ are taken as an inspection batch. Samples shall be marked with item name, sampling date, sample person, etc.

7.2.2.2 Determination rules

Items fail the inspection shall be re-inspected with double sampling volume. If the re-inspection result is qualified, then the batch of products is qualified; otherwise the batch of products is unqualified.

7.3 Type inspection

The inspection items of the type inspection include all the items required in Clause 5, and the inspection frequency of reaction performance is 2/delivery batch. The inspection frequency of other items is shown in Table 5. The sampling and determination rules shall be in accordance with the provisions of 7.2.2. Under normal circumstances, carry out the type inspection once every six months, and the type inspection shall be carried out in one of the following circumstances:

- a) before approval evaluation of new products;
- b) when there are great changes in the design, technology, materials, formulations of catalysts;
- c) when resume production after long-term shutdown;
- d) when the National Quality Supervision Agency requires type inspection;
- e) when the user requires type inspection.

8 Marking, packaging, transportation and storage

8.1 Marking

The catalyst module shall be marked with a fixed mark in the obvious position, indicating the product name, model, manufacturer name, factory-exit code, etc.

8.2 Packaging

8.2.1 The product packaging shall be marked with markings as specified in GB/T 191.

8.2.2 The outer packaging shall be marked with the name and address of the receiving organization and shall be marked with the name of the manufacturer.

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