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

GB/T 31584-2015

Plate-type DeNOx 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. Main drafters of this Standard. Jiang Xiaoming, Xu Xusheng, Li Qian, Wang Hu, Li Xiaohai, Zhu Lin, Kong Fanhai, Zhao Bo, Li Zhefei, Dong Xiaozhen. Plate-type DeNO_x catalysts

1 Scope

China's national product standard for plate-type flue gas denitrification catalysts. It specifies the terms and definitions, the product specifications, the requirements, the test methods, the inspection rules, the marking, packaging, transport and storage, and the documents accompanying the product, and it applies to vanadium-titanium ammonia selective catalytic reduction plate-type catalysts. Selective catalytic reduction is the process by which nitrogen oxides are removed from the flue gas of a coal-fired boiler: ammonia is injected upstream of a catalyst bed, and over the catalyst the ammonia reacts with the nitrogen oxides to give nitrogen and water. The catalyst is what makes that reaction happen at flue gas temperature and, crucially, what makes it selective - without it the ammonia would simply burn. A plate-type catalyst is defined here as one made by coating the active material onto a metal mesh substrate and firing it, and that construction is the whole reason for its

existence. Chinese coal-fired boilers produce flue gas with a very high fly ash burden, and an ash-laden gas passing through a catalyst does two things: it erodes the catalyst surface, and it blocks the channels. A plate-type element has wide parallel gaps between flat plates and a metal skeleton carrying the load, so it resists both far better than an extruded ceramic honeycomb does. It pays for that with a lower geometric surface area per unit volume, which means a larger reactor for the same conversion. The requirements accordingly cover activity, ammonia slip, sulfur dioxide oxidation rate, wear resistance, strength and pressure drop, together with the surface area and pore structure that underlie them. Issued on 2 June 2015 and in force since 1 January 2016.

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

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

6.4.3 Result calculation

6.4.3.1 Denitrification efficiency The denitrification efficiency η of catalysts is calculated according to equation (4). where. C_1 - the concentration of NO_x (standard state, dry basis) in reactor inlet, in milligrams per cubic meter (mg/m³); C_2 - the concentration of NO_x (standard state, dry basis) in reactor outlet, in milligrams per cubic meter (mg/m³).

6.4.3.2 Activity When the NH₃/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).

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;