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Replacing GB 21347-2012, GB 31338-2014

Norm of Energy Consumption per unit Throughput of Industrial Silicon and Magnesium

工业硅和镁单位产品能源消耗限额

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Foreword

This Document was drafted as per the rules specified in GB/T 1.1-2020 *Directives for Standardization – Part 1: Rules for the Structure and Drafting of Standardizing Documents*.

This Document replace GB 21347-2012 *The Norm of Energy Consumption Per Unit Products of Magnesium Metallurgical Enterprise*, and GB 31338-2014 *The Norm of Energy Consumption Per Unit Products of Silicon Metal*. Compared with GB 21347-2012 and GB 31338-2014, this Document has the major technical changes as follows besides the structural adjustments and editorial modifications:

a) Change the advanced value, access value and limited value of the energy consumption limit per unit product of industrial silicon and magnesium to level 1, level 2 and level 3 of the energy consumption limit level respectively; and change the energy consumption limit level of industrial silicon and magnesium unit product value; add the classification of the industrial silicon energy consumption limit level value according to the main reducing agent (see Clause 4 of this Document; Clause 4 of GB 21347-2012 and Clause 4 of GB 31338-2014);

b) Delete the calculation principle (see 5.1 of GB 21347-2012 and 5.1 of GB 31338-2014);

c) Change the statistical range of comprehensive energy consumption per unit product of industrial silicon and magnesium (see 6.1 of this Edition; 5.3 of GB 21347-2012 and 5.2 of GB 31338-2014);

d) Change the calculation method of comprehensive energy consumption per unit product of industrial silicon and magnesium (see 6.2 of this Edition; 5.2 of GB 21347-2012 and 5.3 of GB 31338-2014);

e) Delete energy saving management and measures (see Clause 6 of GB 21347-2012 and Clause 6 of GB 31338-2014).

Please note some contents of this Document may involve patents. The issuing agency of this Document shall not assume the responsibility to identify these patents.

This Document was proposed by and under the jurisdiction of Standardization Administration of People's Republic of China.

The historical editions replaced by this Standard are as follows:

--- This Document was first-time published in 2008; first-time revised in 2012;

--- It is the second-time revised hereby; this revision combines the contents of GB 31338-2014 *The Norm of Energy Consumption Per Unit Products of Silicon Metal*.

Norm of Energy Consumption per unit Throughput of Industrial Silicon and Magnesium

1 Scope

This Document stipulates the grade, technical requirements, energy consumption statistical range and calculation method for norm of energy consumption per unit throughput of industrial silicon and magnesium.

This Document is applicable to the calculation and assessment of energy consumption per unit throughput of industrial silicon and magnesium, as well as the energy consumption control of new construction, renovation and expansion projects. Among them, the energy consumption per unit throughput of magnesium is applicable to the silicothermal magnesium smelting process and is not applicable to other processes such as electrolysis.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 2589 General principles for calculation of the comprehensive energy consumption

GB/T 2881 Silicon metal

GB/T 3499 Magnesium ingots

GB/T 12723 General principles for establishing allowance of energy consumption per unit throughput

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in GB/T 2589 and GB/T 12723 apply.

a) Main production system: including the amount of energy consumed by the smelting process, refining process, casting, crushing and screening. It mainly includes the energy consumptions by the following objects, such as the smelting power consumption of the production system (including furnace charge heating, smelting to maintain furnace conditions, oven electricity, furnace washing electricity, power electricity, lighting electricity), carbonaceous reducing agents for ore reduction (including petroleum coke, coal, charcoal, etc., biomass energy such as wood chips is excluded) and energy-consuming working fluids (water, oxygen, compressed air, etc.). Electrode losses are not included in the energy consumption of the production system.

b) Auxiliary production system: including raw material preparation, transportation, pouring, finishing, environmental protection facilities, circulating water system and the amount of energy consumed in the transportation of materials and industrial silicon. The calculation needs to deduct the electricity consumed by desulfurization and denitrification during deep flue gas purification.

c) Ancillary production system: equipment and facilities required to provide services during the production process, including the amount of energy consumed by raw material testing, laboratory testing, vehicle transportation, maintenance, factory canteens, administrative management, etc.

6.1.2 Magnesium

The comprehensive energy consumption per unit throughput of magnesium includes the energy consumption of the smelting production system, the energy consumption of the auxiliary production system and the energy consumption of the ancillary production system; excluding the amount of secondary energy [export coal, slime and gangue, tar residue , semi-coke (blue carbon and clean carbon), tar, etc.] recycled and supplied externally during the production process; excluding domestic energy and energy consumed by approved infrastructure project. Details are as follows.

a) Main production system: including the amount of energy consumed by the gas production process, calcination process, preparation process, reduction process and refining process.

NOTE: The combined silicothermal method has a gas production process, while the traditional silicothermal method does not have a gas production process and uses purchased energy for magnesium smelting production.

b) Auxiliary production system: the energy consumed by equipment and facilities required for the normal completion of auxiliary production (including wind, oil, water, gas, oxygen and other systems required for production, fans, dust collection, smoke treatment, instrumentation and environmental protection facilities, etc.).

c) Ancillary production system: equipment and facilities required to provide services during the production process, including the amount of energy consumed by raw material testing, laboratory testing, vehicle transportation, maintenance, factory canteens, administrative

management, etc.

6.2 Calculation method

The comprehensive energy consumption per unit throughput of industrial silicon or magnesium is expressed by e_X (X is Si or Mg), and the unit is kilograms of standard coal per ton (kgce/t), calculated according to Formula (1):

$$e_X = \frac{\sum_{i=1}^{n}(k_i \cdot e_i) + E_{FZ} + E_{FS} - E_{HW}}{M_X} \quad \cdots\cdots(1)$$

Where:

k_i - the conversion coefficient of type i^{th} energy (including energy-consuming working fluids) consumed by the main production systems during the statistical reporting period;

e_i - The physical amount of type i^{th} energy consumed by the main production systems during the statistical reporting period (including the amount of energy consumed by energy-consuming working fluids);

E_{FZ} - The energy consumption of the auxiliary production system during the statistical reporting period, in kgce;

E_{FS} – The energy consumption of ancillary production systems during the statistical reporting period, in kgce;

E_{HW} - The amount of secondary energy recovered and supplied externally during the statistical reporting period, in kgce;

M_X – The output of industrial silicon or primary magnesium ingots qualified for storage during the statistical reporting period, in tons (t). Industrial silicon shall comply with the provisions of GB/T 2881, and primary magnesium ingots shall comply with the provisions of GB/T 3499.

6.3 Conversion coefficient

The low calorific value of energy and the energy consumption of energy-consuming working fluids shall be converted into standard coal based on actual measured values or data provided by the supply organization. If the actual measured value cannot be obtained, the standard coal conversion coefficient can refer to the data published by the National Bureau of Statistics or the data given in Appendixes A and B. For self-produced secondary energy, the standard coal conversion coefficient shall be calculated and determined based on actual input and output.

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