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Code for design of alumina refinery process

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1 General

1.0.1 This standard is formulated to unify the technical requirements for process design of alumina plants, promote technological progress, improve design quality, and achieve advanced technology, reasonable economy, safety and reliability.

1.0.2 This standard applies to the process design of new, expanded and reconstructed alumina plants that use diasporite type, gibbsite type and mixed type bauxite as raw materials to produce metallurgical grade alumina.

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2.0.1 Alumina

A stable oxide of aluminum with a variety of different crystal forms, the molecular formula is Al_2O_3 .

2.0.2 Aluminum hydroxide

The crystalline substance separated from the sodium aluminate solution has the molecular formula $Al(OH)_3$.

2.0.3 Metallurgical grade alumina smelter grade alumina

Alumina used in the production of metallic aluminum by molten salt electrolysis.

2.0.4 Bauxite

It is a general term for ores composed of diasporite, gibbsite or boehmite as the main mineral, and composed of silicon, iron and titanium in different amounts and small or trace amounts of other element compounds.

2.0.5 Diasporite diasporite

Oxygen-hydroxide of aluminum with a density of $3.3g/cm^3$ - $3.5g/cm^3$ and a Mohs hardness

of 6.5-7. It belongs to the orthorhombic system, and its molecular formula is AlOOH or $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$.

2.0.6 Boehmite boehmite

Oxygen-hydroxide of aluminum with a density of 3.01g/cm^3 - 3.06g/cm^3 and a Mohs hardness of 3.5-4. It belongs to the orthorhombic system, and its molecular formula is AlOOH or $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$.

2.0.7 Gibbsite gibbsite

Oxygen-hydroxide of aluminum with a density of 2.35g/cm^3 - 2.42g/cm^3 and a Mohs hardness of 2.5-3.5, belonging to the monoclinic crystal system, with a molecular formula of $\text{Al}(\text{OH})_3$ or $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$.

2.0.8 mixed bauxite

A gibbsite ore containing part of boehmite, or a diaspore mine containing part of boehmite.

2.0.9 Red mud red mud

The residue after extracting alumina by Bayer method or sintering method.

2.0.10 Bayer process

A production method in which the alumina in the bauxite is directly leached with caustic lye to obtain a sodium aluminate solution, and then diluted and decomposed to produce alumina.

2.0.11 sintering process

The aluminum-containing raw material is calcined by batching, so that the alumina in it is converted into soluble sodium aluminate.

2.0.13 serial combination process

The red mud processed by the Bayer method of bauxite is then processed by the sintering method to recover the alumina and alkali in the alumina production method.

2.0.14 parallel combination process

High-grade bauxite is processed by Bayer method, low-grade bauxite is processed by sintering method, and the sodium aluminate solution produced by sintering method is used to supplement the alumina production method lost by Bayer method.

2.0.15 mixed combination process

The red mud processed by the Bayer method is mixed with an appropriate amount of bauxite, and then processed by the sintering method for the production of alumina.

2.0.16 Circulating lye test liquor

Lye for return batching in alumina production.

2.0.17 bauxite slurry

Slurry for Bayer dissolution prepared according to production process requirements.

2.0.18 Raw slurry

The slurry used for firing clinker prepared according to the requirements of the production process.

2.0.19 alkali red mud alkali red mud

In the combined production, the Bayer process red mud slurry after adding alkali powder.

2.0.20 Dissolution digestion

The process of leaching alumina from bauxite with caustic lye at the dissolution temperature.

2.0.21 effective alumina total available alumina

Alumina that can dissolve from bauxite into solution under defined dissolution conditions.

2.0.22 reactive silica

Under determined stripping conditions, silica in bauxite reacts with alkali resulting in loss of alumina and sodium oxide.

2.0.23 Single-stream dissolution single-stream digestion

Dissolution technology in which circulating lye and raw ore pulp are heated together.

2.0.25 pre-desilication

Before the raw ore pulp enters the dissolution heating device, the process of making activated silica react with alkali to convert it into hydrated sodium aluminosilicate or hydrated garnet.

2.0.26 Caustic ratio molar ratio

Molar ratio of caustic soda to alumina in sodium aluminate solution.

2.0.27 Clinker firing sintering

The process in which raw slurry is calcined at high temperature to become aluminate clinker.

2.0.28 clinker dissolution sinter leaching

The process of dissolving useful components in clinker with water or dilute alkali solution.

2.0.29 Pregnant liquor

Dissolving the sodium aluminate solution after separating the red mud from the slurry.

2.0.30 Crude liquid desilication desilication

It is a desiliconization process that converts the silicon oxide in the crude liquid into compounds with low solubility and precipitates as solid precipitates.

2.0.31 sodium aluminate solution

The alumina hydrate in bauxite is under the action of caustic lye, and the solid-phase sodium aluminate in clinker is under the action of water or dilute lye to form a solution containing sodium ions and aluminate ions.

2.0.32 control filtration control filtration

Before the seeds are decomposed, the filtration process is used to purify the suspended solids in the sodium aluminate solution.

2.0.33 semen green liquor

Refined sodium aluminate solution that controls the content of suspended solids after filtration and meets the technical requirements for decomposition.

2.0.34 Seed precipitation

The process of adding seeds to sodium aluminate solution, lowering the temperature, and precipitating aluminum hydroxide.

2.0.35 Carbonation precipitation

The process of passing carbon dioxide gas into the sodium aluminate solution to neutralize the caustic alkali in the solution and precipitate aluminum hydroxide.