

# Fused Ceramic Sand

**Most Cost Effective Artificial Spherical Sand Since Century 21**

(Written by Fan Li Wei, Managing Director of Luoyang Siamatec Co., Ltd)



In the late 1990s, a new type of artificial spherical casting sand was developed by local casting engineers in Luoyang. After 2000, it was successively put into the domestic and foreign markets. Now the mainstream production base is located in the surrounding areas of Luoyang. Our company began to sell to overseas markets in 2001 and has successively recommended to the foundry markets in Korea, Japan, Malaysia, Indonesia, Turkey, India, Italy and other countries.

The high-quality refractory grade sintered bauxite clinker from Shanxi Province is used as the raw material. In a special small electric arc furnace, the crushed bauxite is instantly remelted into liquid after more than 2000 degrees centigrade. Then the bauxite liquid is blown into black or gray black spherical particles of different sizes by the high pressure provided by the air compressor, and then cooled naturally. This balling process is called "Air Cutting Method".

Through the specially designed screening process, to remove the aluminum silicate fiber (which can be used as thermal insulation material), large and irregular particles without commercial value generated in the melting process, screen the particle sizes of different mesh and store them in different areas. Mix the sand evenly according to the particle size distribution of the average fineness required by the customers, and then packing and delivery can be done.

Each batch of raw materials shall be subject to chemical analysis at least twice after entering the factory and melting to ensure that the chemical composition meets the standards of different levels. The higher the passing rate of single objective particle size, the easier and more accurate sand preparation, and the narrower the range of particle size composition. Grasping the most reasonable particle size distribution can effectively improve the strength of molding sand and win the quality recognition of casting users. In the screening process, for medium and high-end customers, we should also remove mechanical iron and free iron (metallic iron) by strong magnetic separator. This can better improve the overall refractoriness and service temperature of sand.

## 1. Chemical Compositions:

Al<sub>2</sub>O<sub>3</sub> 68-80%  
Fe<sub>2</sub>O<sub>3</sub> ≤ 3%  
TiO<sub>2</sub> ≤ 4%  
SiO<sub>2</sub> 15-25%  
K<sub>2</sub>O+Na<sub>2</sub>O ≤ 1.5%

From the chemical compositions of fused ceramic sand, it is not difficult to find that it is equivalent to refractory raw material – mullite grade M70. But the difference is that the corundum phase in fused ceramic sand is higher than mullite phase, corundum-mullite phase totally 80-85%, and the balance 15-20% is glass phase. The performance and quality of corundum-mullite class silicon aluminum refractory after one-time sintering and one-time electric melting can reach or even higher than sintered and fused mullite grade M70. This is enough to meet the needs of various metal castings.

## 2. Physical Properties

- 1) Color: black or gray black;
- 2) Shape of Particle: spherical;
- 3) Angle Coefficient: <1.1;
- 4) Bulk Density: 1.95-2.05 g/cm<sup>3</sup>;
- 5) PH Value: 7-8;
- 6) Thermal Conductivity: 0.5-0.6 W/m\*k (at 1000°C);
- 7) Thermal Expansion Rate: 0.13% (10 minutes heated at 1000°C);
- 8) Refractoriness: >1800°C;
- 9) Acid Consumption Value: <3.0ml;
- 10) Particle Sizes: a. AFS15, 20, 25, 30, 40, 50, 60, 75, 85, 90, 100, 120, 125, 140, 165 and other customized average fineness;  
b. 0.1-0.4mm, 0.2-0.6mm, 0.3-0.7mm, 0.4-0.9mm and other customized particle sizes;  
c. 140mesh, 200mesh, 270mesh and other customized powders..

## 3. Advantages as Casting Sand:

- 1) The coefficient of thermal expansion is small, which can be comparable with zircon sand. The preparation of mold and core sand can basically eliminate the expansion defects such as casting veins;
- 2) It is nearly spherical, with good fluidity and easy filling. The sand molds and sand cores are of high permeability and the collapsibility after pouring;
- 3) The surface is smooth and the structure is compact, which is convenient for the uniform coverage of the binder and can save 30-50% of the binder;
- 4) It is a neutral material, acid and alkali binder can be used, and is suitable for castings of various materials;
- 5) It can adapt to various regeneration methods and can be recycled all the time. The reclaimed sand is still in excellent performance;

- 6) The high refractoriness and good stability are specially suitable for the production of steel castings with complicated shapes of sand cores;
- 7) The particle size range is wide, which can be combined and mixed freely according to the requirements to meet the different needs from foundries;
- 8) It is an environment-friendly material with high strength, low crushing rate, no dust, non-toxic and other good characteristics;
- 9) It can replace natural molding sands such as chrome ore sand, zircon sand and silica sand and other spherical artificial sands.

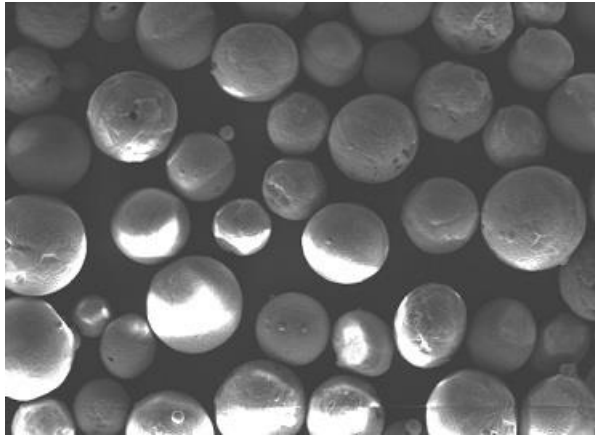
4. Applications that have been developed are as follows:

- 1) Applied for producing resin coated sand, molding and core making;
- 2) Applied for shell casting instead of precision casting process to produce small precision steel castings;
- 3) Applied for cold core box resin sand process to produce automobile castings such as cylinder block, cylinder head and exhaust pipe;
- 4) Applied for the whole line alkaline phenolic resin sand process to produce steel castings;
- 5) Applied for the whole line furan resin sand process to produce steel castings;
- 6) Applied for the whole line process of inorganic binder modified water glass sand to produce cast aluminum and steel castings;
- 7) To replace chromite sand for water glass sand process to produce large steel castings;
- 8) Applied for EPC(lost foam) process and used as EPC filling sand;
- 9) Applied for producing casting coatings;
- 10) Applied for producing EPC coatings;
- 11) Applied for V-method casting as filling sand;
- 12) Applied for 3D printing process; ;
- 13) Used as sand blasting material instead of steel shot and cutting shot;
- 14) Applied for producing ladle filler sand, partially replace chromite sand, to enhance fluidity and reduce cost;
- 15) Applied for monolithic refractories like high alumina castables.

In the production process of fused ceramic sand, dust and noise pollution cannot be avoided, energy consumption is also high, and there is no major breakthrough in the improvement of existing production facilities, which seems not to be the industrial direction encouraged by China at present. Nevertheless, fused ceramic sand is a new generation of artificial sand generally recognized by the casting industry at home and abroad, and the existing mainstream production plants have been transformed through environmental protection facilities to meet the environmental protection evaluation standards, obtained the pollution discharge license, greatly improved the production environment, enhanced the aftereffect for the sustainable development of enterprises, and the total production capacity is rising instead of decreasing to meet the demand growing , with vigorous vitality.

Fused ceramic sand is undoubtedly a kind of green environmental protection material for downstream users. It can be expected to be a modeling material with strong vitality in the casting industry at home and abroad in the coming number of years, because it represents the development

direction of artificial sand. It highlights its significant advantages in improving casting quality, reducing production costs, improving economic benefits, improving production environment and reducing dust hazards. In the new era of advocating sustainable development and green casting, fused ceramic sand will become the "new favorite" of casting sand in the 21st century and play a greater role.



Dear old and new customers, if you want to know more about the detailed product knowledge and use of fused ceramic sand, please feel free to contact us at any time. We also welcome you to visit our official website at: [www.siamatec.com](http://www.siamatec.com). Thank you for your close cooperation.

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Author: Fan Li Wei (Mr.), managing director (& general manager) of Luoyang Siamatec Co., Ltd, got in touch with and started to sell fused ceramic sand in year 2001, with rich industry experience for over 20 years. To know more information, please contact me at H.P. +86-137-0388-2360(WhatsApp), Email: fanliwei@china.com