# Website Information of ETOK Sanat Rad Company

## Products

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# Ferroalloys

(Ferrotitanium - Ferrophosphorus - Types of Germinals - Ferro Silicon Calcium - Ferrochrome -Ferrotungsten - Ferrovanadium - Ferro Silicon Magnesium - Ferromanganese - Ferromolybdenum - Ferro Silicon Manganese - Ferrosilicon)

**Ferrotitanium:**

| Ferrotitanium | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Element** | **MN** | **C** | **S** | **P** | **SI** | **TI** | **N** | **V** | **AL** | **Size** |
| **Ferrotitanium** | 0.3 max | 0.3 max | 0.04 max | 0.06 max | 0.6 max | 70 min | - | - | - | 10-50 mm |
| **Nitrogenous Ferrotitanium** | - | 0.24 max | - | - | 0.21 max | 67.44 % | 0.34 max | 2.27 max | 3.84 % | 5-50 mm |

Description:

Application:

It is a purifier of iron and steel in steelworks. Titanium is highly reactive with sulfur, carbon, oxygen, and nitrogen, and forms insoluble compounds in the slag, therefore it is used for deoxygenation, and sometimes for desulfurization and de-nitrification.

**Ferrophosphorus**:

| Ferrophosphorus | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Element** | **MN** | **FE** | **C** | **TI** | **SI** | **P** | **Size** |
| Present | 3.42 | 68-71% | 3% | 1.17% | 3.36% | 19.22% | 10-50 mm / 30-80 mm |

Description:

Application:

Phosphorous is a destructive factor in steels, therefore its amount does not exceed 3% to 5%. Phosphorus also increases the strength and corrosion resistance against chemical reactions. Ferrophosphorus is mostly used in construction steels and is used as the main component and deoxidizer in the metallurgical industry of special steels. It is also used in the chemical industry to produce phosphate or as an additive in the production of metallic dyes.

**Types of Germinals:**

| Types of Germinals | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Element** | | | **SR** | **SI** | **CA** | **AL** | **ZR** | **BA** |
| **Present** | **Supersid** | 1 | 0.6-1.2 | 45-50 | <0.1 | <0.5 | - | - |
| | | 2 | 0.6-1.2 | 73-78 | <0.1 | <0.5 | - | - |
| | | 3 | 1.2-3 | 73-78 | <0.1 | <0.5 | - | - |
| | **Zirsinoc** | 85 min | - | 72-78 % | 0.5-1.5 % | 0.5-1.5 % | 1.5-2.5 % | - |
| | | 86 min | - | 60-65 % | 0.5-1.5 % | 0.5-1.5 % | 4.6 % | - |
| | | 87 min | - | 45-55 % | 1-20 % | 1-2 % | 25-30 % | - |
| | | 88 min | - | 40-50 % | 1-20 % | 1-2 % | <30% | - |
| | **Barium Germinal** | 1 | - | 70-71 % | 1-2 % | 1-2 % | - | 1-2% |
| | | 2 | - | 65-70 % | 1-2 % | 1-2 % | - | 4-6% |
| | | 3 | - | 50-60 % | 1-2 % | 1-2 % | - | <25% |
| | | 4 | - | 50-60 % | 1-2 % | 1-2 % | - | <28% |

Description:

Application:

Some metals and ferroalloys are added to Ferrosilicon base and with compounds such as Zirconium, Strontium and Barium in various granulations to cast iron and graphite steel, and they will be tuned in the form of sheets, which is done by controlling the speed at which eutectic points occurs. In the past, without knowing this, Ferrosilicon was used with fine granulation to achieve this goal, explaining that Strontium is suitable for gray cast iron and steel and Zirconium is suitable for ductile cast iron.

**Ferro Silicon Calcium:**

| Element | CA | SI | AL | C | P | S |
|---|---|---|---|---|---|---|
| Present | 30% | 60% | 2% | 1% | 0.04% | 0.05% |
| | 28% | 60% | 2% | 1% | 0.04% | 0.05% |

Description:

Application:

Calcium Silicide (CaSi) is a substance that is added to the steel to boost the speed of pouring; also increasing the temperature and degassing are other CaSi properties. Calcium Silicide is available in sizes of 3 to 10 mm.

**Ferrochrome:**

| Ferrochrome | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Element** | | **S** | **P** | **SI** | **C** | **CR** | **N** | **Size** |
| **Present** | **High Carbon Ferrochrome** | 0.05% max | 0.03% max | 3% max | 6-8% | 60-65 % | - | 10-60 |
| | **Low Carbon Ferrochrome** | 0.63 max | - | - | 0.077% max | 60-65 % | - | 10-50 |
| | **Nitrogenous Ferrochrome** | 0.04% | 0.035% | 1.5% | 0.06% | 60% | 7% | 10-100 mm |
| | | 0.03% | 0.03% | 2% | 0.04% | 65-72% | 6-8% | 10-50 mm |

Description:

Application:

Ferrochrome is produced from condensation, enrichment, pelletizing, and agglomeration of heat treatment. Ferrochrome is mainly used in the production of stainless steel, hard steels, as well as some valuable alloys, and increases their anti-erosion resistance. It is also used for plastering and creating a hard and beautiful surface, as well as for anti-corrosion resistance.

Its other uses include for producing iron and steel in casting, glass, cement, ceramics, machinery, plastering, decreased decay, metal bright-work, pigments, steel hardenability in oil and air, decreased impact resistance, tanning compounds and protecting wood.

**Ferrotungsten:**

| Ferrotungsten | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Element** | **W** | **SI** | **C** | **MN** | **CU** | **P** | **S** | **AS** | **SB** | **SB** | **Size** |
| Present | 75 | 0.6% max | 1 max | 0.6% max | 0.2% | 0.05 max | 0.05 max | 0.1 max | 0.08% | 0.1 max | 10-50 |

Description:

Application:

Producing Tungsten Containing Steels: Ferrotungsten is used because of the high melting point for solid alloys and has the highest melting point after carbon.

**Ferrovanadium:**

| Ferrovanadium | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Element** | | **C** | **N** | **AL** | **SI** | **MN** | **P** | **S** | **V** | **Size** |
| Present | **Ferrovanadium** | 0.25% | - | 1.5% | 1% | 0.2% | 0.035% | 0.05% | 81% | 30-50mm |
| | **Nitrogenous Ferrovanadium** | 10% | 10-14 | - | - | - | 0.06% | 0.1% | 76-81% | 10-55mm |

Description:

Application:

The most important application of Ferrovanadium is in the alloying process of any hard steel. Alloy steel is used in manufacturing gears, axles, crankshafts, bicycle frames and other very essential steel parts. The properties of Ferrovanadium can be attributed to the creation of fineness, and increase of hardness and abrasion resistance in the steel industry.

**Ferro Silicon Magnesium:**

| Ferro Silicon Magnesium | | | | | | |
|---|---|---|---|---|---|---|
| **Element** | **RE** | **AL** | **CA** | **MG** | **SI** | **Size** |
| Present | 0.5 - 1% | 1.2 max | 0.8 - 1.4% max | 5.6 - 5% max | 43 - 48% | 1-5, 6-15, 10-35 |

Description:

Application:

Ferro Silicon Magnesium, which is used in the production of ductile iron, compacted graphite cast iron and steel refining, is produced by using high quality Ferrosilicon as the raw material and with precise control of the chemical composition and qualitative melt operation. By adding Ferro Silicon Magnesium to cast iron and steel alloys, in addition to the spheroidization of graphite, increases impact strength in casting parts and also increases strength.

**Ferromanganese:**

| Ferromanganese | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Element** | | **MN** | **C** | **SI** | **P** | **S** | **Size** |
| Present | High Carbon | 75-78% | 7.3% max | 1.2% max | 0.35% max | - | 10-50 |
| | Medium Carbon | 80% min | 1-1.5% min | 1.2 max | - | - | 10-60 |
| | Low Carbon | 83.92 | 0.37 | 0.88 | 0.031 | 0.0037 | 10-50 |

Description:

Application:

The most important application of Manganese in the industry is the production of iron alloys and as a basic material for the production of cast iron and steel. Manganese is most used in the production of steel (carbon steels, low resistance alloy, anti-corrosion for tools) and non-steel alloys (non-ferrous alloys, ferroalloys and castings). Steel, especially carbon steels, is central part of the Manganese market.

**Ferromolybdenum**:

| Ferromolybdenum | | | | |
|---|---|---|---|---|
| **Element** | **MO** | **CU** | **C** | **SI** |
| Present | 60-65% min | 1.2% max | 0.1% min | 1.5% max |

Description:

Application:

Ferromolybdenum is an alloying agent in steel and cast iron to increase strength and resistance, and its alloy with tungsten takes place of platinum. It is uses anticathode in X-ray lamps of radiological devices, as well as pigment for printing ink 222, paints and ceramics, catalysts, solid lubricants, parts of missiles and planes, reactors, turbine blades, die casting of copper alloys, special batteries, and special alloys and steels.

**Ferro Silicon Manganese:**

| Ferro Silicon Manganese | | | | | |
|---|---|---|---|---|---|
| **Element** | **MN** | **C** | **SI** | **P** | **Size** |
| Present | 65% min | 2.23% max | 17% min | 0.02 max | 10-60 |

Description:

Application:

Ferro Silicon Manganese is a ferrous alloy produced by the melting of manganese ore and quartzite in the presence of coke in electric arc furnaces. It is used as a deoxidizer and for regulating chemicals from silicon and manganese in iron and steel.

**Ferrosilicon:**

| Ferrosilicon | | | | | | |
|---|---|---|---|---|---|---|
| **Element** | **SI** | **AL** | **C** | **P** | **S** | **Size** |
| Present | 72% | 2% max | 0.20% | 0.05% | 0.04% | 10-60 |
| | 70% | 2.3% max | - | - | - | 10-30 |

Description:

Application:

- Silicon augmentor agent for the production of high-silicon alloy cast irons and high-silicon alloy steels;
- Germination agent in casting of graphite cast irons in alloy for the production of Ferro Silicon Magnesium in order to produce ductile cast irons;
- Deoxidizer in steel making;
- Alloyer in the production of cast iron and steel.

# Ferrous Substances

(Pellets Oxide Scale, Sponge Iron)

**Pellets:**

| Pellets | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Element** | **Fe Total** | **FeO** | **P** | **S** | **CaO + MgO** | **$Al_2O_3$ + $SiO_2$** | **$B_4$** |
| Present | 66% min | 0.6% max | 0.05% max | 0.01% max | 2.8% max | 2.7% max | 1.04% max |

Description:

Application:

Pellets are the final product of the pelletizing process and the raw material for the processes of producing pig iron in blast furnaces and producing sponge iron in a variety of direct reduction methods. For the application of pellets, its quality should be optimized for transportation and so on.

In the conventional term, pellets are bullets made from iron ore and other additives that are first raw and then hard or baked and are used to reduce in the traditional method of producing iron in blast furnaces or a variety of direct reduction methods.

**Oxide Scale:**


| Oxide Scale | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Element** | **$SiO_2$** | **$U_2O_5$** | **P** | **S** | **$Al_2O_3$** | **Femet** | **MgO** | **FeO** | **CaO** | **Mn** | **$TiO_2$** | **Fetot** |
| Present | 0.24 % | 0.013 % | 0.007 % | 0.009 % | 0.80 % | 1.21% | 0.002 % | 56.8 % | 0.13 % | 0.36 % | 0.015 % | 74.2 % |

Description:

Application: Oxide scales in process of casting, slab, and rolling mill are separated from the surface at high temperature. In hot rolling process of steel ingots, about 2% of the rolled steel is removed as wasted oxide scales from the production line. Recycling these scales can be economically important. One of the ways to recycle scales is to reduce them by using reducing agents. Reducing agents (including coal, coke, and graphite) are reduced at fixed bed and at a certain temperature. Parameters such as temperature (T), particle size of reducing agent (D), coal to scale ratio (M), oxidation of scales before reduction and type of the reducer, affect the evaluated reduction degree. Iron oxide scales typically contain magnetite with the color of blue-gray or stainless steel and have an outer thin scale of $Fe_2O_3$ Hematite that is not readily visible to the unproductive eye. The inner part of the magnetite contains metallic grains and sometimes the remaining FeO is black, which results in the metal becoming harder.

The oxide scale is found in the production of all steel products in hot rolling, unless they do iron melting in fail-safe furnaces like galvanized sheet. At high temperature hot rolling furnaces, there is a layer of our Wustite and FeO between steel and magnetite. At high temperatures, 85% of the thickness of the oxide scale consists of FeO, about 10 to 15% of it consists of $Fe_3O_4$, and 0.5 to 2% is $Fe_2O_3$. During the slow cooling (at temperatures below 1040º F) of hot rolling in the rotation of furnace bar the most of existing FeO is converted to Fe3O4, and after complete cooling, FeO has the highest amount.

**Sponge Iron:**

| Sponge Iron | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **C** | **S** | **P** | **$SiO_2$** | **$Al_2O_3$** | **Size** | **Total Iron** | **Total Gangue** | **Metallization** |
| Present | 0.12% max | 0.005% max | 0.08% max | 4% max | 0.5% max | 9-18 mm | 88-92% | Ave 4.5% | 91-93% |

Description:

Application:

Coke in blast furnaces has different roles in energy supply, reducing iron ore, porosity for the passage of reducing gases and carburizing cast iron. In cupola furnaces, coke is also used as a fuel and a reducing agent. It should be noted that coke is also used in the casting industry.

# Steel Profiles

(Blast Furnace Cast Iron, Grey Cast Iron, Alloy Cast Iron, Alloy Steel, Ductile Cast Iron, Rebar, Steel Ingot)

**Blast Furnace Cast Iron:**

| Blast Furnace Cast Iron | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Element** | **C** | **Si** | **Mn** | **S** | **P** | **Size** | **Weight** |
| Present | 3.5-5% | 0.08% max | 1.1% max | 0.012% max | 0.018% max | 330mm * 550 * 100 | 50 kg max |

Description:

Application:

The product of blast furnaces is the blast furnace cast iron, which should be changed in order to convert it to other iron derivatives, especially steel. The blast furnace cast iron usually has impurities that is melted again to convert to other ingots or casting parts, and then re-cast after purifying and alloying.

**Grey Cast Iron:**

| Grey Cast Iron | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Element** | **C** | **Si** | **Mn** | **P** | **S** | **Cr** | **Al** | **Cu** |
| Present | 4.08% | 1.82% | 0.419% | 0.03% | 0.08% | 0.089% | 0.024% | 0.135% |

Description:

Application:

It is used for complex components and thin walls with less mechanical stress tolerance, such as shells, cases, sliding bearings, dry bushings and heated parts. Also, in modeling, grey cast iron is used for the model plate, small models and metal molds.

**Alloy Cast Iron:**

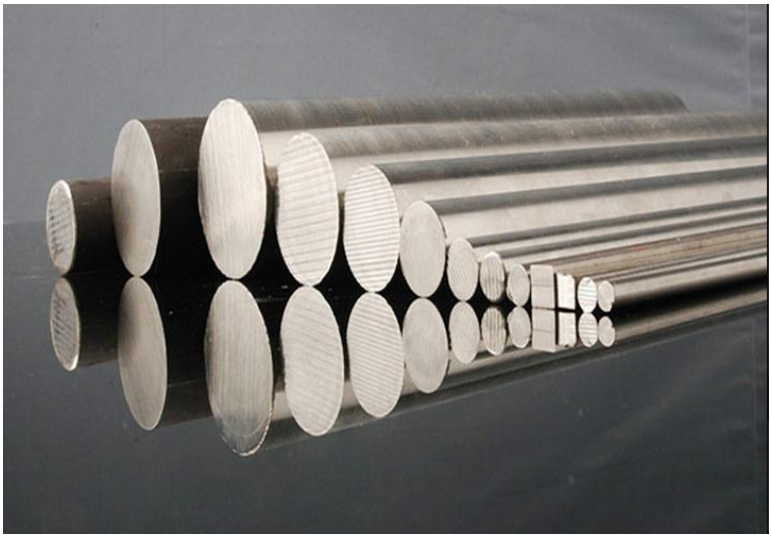
Description:

Application:

Alloy cast irons are used in cases where extreme resistance to abrasion, heat or corrosion is required.

In addition, when non-conventional physical properties such as low heat expansion or non-magnetic properties are considered, these cast irons are used. Castings parts of alloy cast iron are produced by foundries that are specialized in this regard, because adding 3 to 30 percent of the alloying element to molten cast iron requires the use of melting equipment, casting techniques, and special quality control. It is often difficult to identify and determine the specific properties required in alloys, so they are always identified based on the chemical composition. The desired mechanical properties can also be determined if important. Alloy cast irons are classified according to the type of non-conventional use and their specific properties.

**Alloy Steel:**



| | | | | |
|---|---|---|---|---|
| Mo40 | 42CrMo4 | 42CrMoS4 | C45 | Ck45 |

Description:

Application:

Alloy steels, also called special steels, are specific products and contain a small amount of alloying elements such as chromium, cobalt, manganese, molybdenum, nickel, niobium, silicon, tungsten or vanadium.

**Ductile Cast Iron:**

Table for Chemical Analysis:

| USA | Germany |
|---|---|
| 60-40-18 | GGG40 |
| 70-50-05 | GGG50 |
| 80-60-03 | GGG60 |
| 100-70-03 | GGG70 |
| 120-90-02 | GGG80 |

Table for Physical Analysis:

| **Ductile Cast Iron** | | | | | |
|---|---|---|---|---|---|
| **Element** | **C** | **Si** | **Mn** | **P** | **S** |
| Present | 4.5 - 4.2 % | 1.5 - 1.7 % | 0.2 - 0.3 % | 0.01 % | 0.02 - 0.03 % |

Description:

Application:

These cast irons are used in components that require strength, change in length and high hardness. For example in the manufacture of gears, crankshafts, rear axles of cars or in the manufacture of lathe stands that are heavy and on the other hand should tolerate the chipping forces, spheroidal graphite cast irons are used.

**Rebar:**

Description:

Application:

Rebar is an iron or steel armature used in concrete to compensate for concrete’s low tensile strength. Steel used in reinforced concrete structures for this purpose is in the form of wire or bar and the steel is called a rebar. Of course, in certain cases, construction steel such as I-shaped profiles, channel sections or cans are also used to reinforce concrete.

## Steel Ingot:

| Steel Ingot | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **ESP** | **CR** | **CU** | **C** | **SI** | **MN** | **P** | **S** | **N** |
| Present | 1.5 mm 10*10$12*12 | 0.3% max | 0.04% max | 0.14 - 0.22% max | 0.15-0.3% max | 0.3-0.65% max | 0.05 max | 0.04 max | 0.03 max |

# Coke and Carbon Substances

(Coal, Charcoal, Graphite Electrode, Formcoke, Carbon Block, Anthracite)

**Coal:**

Description:

**Application:** Coal is used as fuel in thermal power generating plants, steam production by steam turbines in industrial plants, railways and ships, and also as household fuels in some countries. Almost 87% of the world's coal is burned to generate heat and other types of energy.

Obviously, along with the burning of coal, side products such as fuel gases, coke and tar are also obtained. It should be noted that in some parts of the world, part of urban gas fuels are produced from coal.

For this purpose, coal becomes adjacent to a stream of water and oxygen at a pressure of 20 to 30 atmospheres. In this operation, part of the coal is converted into hydrogen and carbon monoxide in the vicinity of water vapor and oxygen. Then, these gas products are converted to hydrocarbon in the vicinity of the iron catalyst, or converted to methyl alcohol by zinc and copper catalyst. In addition to fuel consumption, coal is used to produce a lot of useful and important organic and inorganic materials, mainly from tar distillation from coal pyrolysis or solids remaining from pyrolysis.

**Coal Production Process:**

Coal is an energetic mineral that originates from the remains of trees, shrubs and other living plants millions of years ago. Growing these plants took place in periods where the weather was mild and humid on the earth. Coal is a sedimentary rock. Most of these reserves came about 250 million years ago. Then the conditions for growing of massive tropical seed ferns and giant flowerless trees were provided in large swamps. These plants fell off into swamps after drying and disappearing, and as a result of oxygen exits, anaerobic corruption accelerated. Vegetation became a slime-like substance, called peat. Peat was dried and hardened under pressure and turned to peat coal (Lignite, also known as brown coal). The greater pressure and the passage of time created gas coal. Each 6 meter of thickness of plants sedimentation first turned into 0.3 m of coal, and eventually produced the hardest and highest quality type of coal, called Anthracite.

**Charcoal:**

Description:

Application:

Charcoal is a lightweight, brittle, and black material, remained of half-burning of wood or other plant and animal organs, most of which compounds have been converted to carbon. This gross carbon is composed of 85 to 98 percent carbon.

**Graphite Electrode:**

| Item | | Unit | Nominal Diameter | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | UHP | | HP | | RP | |
| | | | Φ300-44 | ≥Φ450 | Φ250-400 | ≥Φ450 | Φ250-400 | Φ450-600 |
| Electric Resistivity | Electrode | μΩm | ≤ 4 | ≤ 5.5 | ≤ 6 | ≤ 6.5 | ≤ 8.5 | ≤ 9 |
| | Nipple | | ≤ 4 | | ≤ 4.5 | | ≤ 5.5 | |
| Transverse Strength | Electrode | MPa | ≥ 15 | | ≥ 10.5 | | ≥ 8 | ≥ 7 |
| | Nipple | | ≥ 24 | | ≥ 20 | | ≥ 16 | |
| Young's Modulus | Electrode | GPa | ≤ 14 | | ≤ 12 | | ≤ 9.3 | |
| | Nipple | | ≤ 18 | | ≤ 16 | | ≤ 14 | |
| Bulk Density | Electrode | g/cm3 | ≥ 1.68 | | ≥ 1.65 | | ≥ 1.54 | |
| | Nipple | | ≥ 1.76 | | ≥ 1.74 | | ≥ 1.70 | |
| Coefficient of Thermal Expansion | Electrode | 10-6/C° | ≤ 1.5 | | ≤ 2 | | ≤ 2.5 | |
| | Nipple | | ≤ 1.2 | | ≤ 1.6 | | ≤ 2 | |
| Ash | | % | ≤ 0.2 | | ≤ 0.2 | | ≤ 0.2 | |

Description:

**Application**: Graphite electrodes are produced using high-pressure and vacuum calcinated materials, saturated in graphite furnaces, and finally, the machining process is performed on them. Graphite electrodes are available in diameters ranging 100 to 700 mm in three types: RP, HP and UHP. High-current HP type is used for ladle furnaces casting and occasionally for operations in electric arc furnaces. High-current UHP type is used for electric arc furnaces and ladle furnaces under heavy load.

**Formcoke:**

| Formcoke | | | | | |
|---|---|---|---|---|---|
| **Element** | **Ash** | **vM** | **Moisture** | **S** | **FC** |
| Present | 12.5 % max | 2.5 % max | 8 % max | 0.6 % max | 85 % min |

**Carbon Block:**

| Carbon Block | | |
|---|---|---|
| **Element** | **C** | **Size** |
| Present | 80 % min | ۱۰۰ × ۷۰ × ۵۰ cm |

Description:

Application:

Carbon block is a subset of filtration technologies, which performs a wider range of filtration tasks. Its structure is made of carbon powder, thermoplastic and flexible against heat and other additives, which eliminates sediment and organic chemicals.

**Anthracite:**

| Anthracite | | | | | |
|---|---|---|---|---|---|
| **Element** | **Ash** | **S** | **VM** | **Humidity** | **FC** |
| Present | 3.4 % | 0.5 % | 0.5 % | 0.5 % | 95 % |

Description:

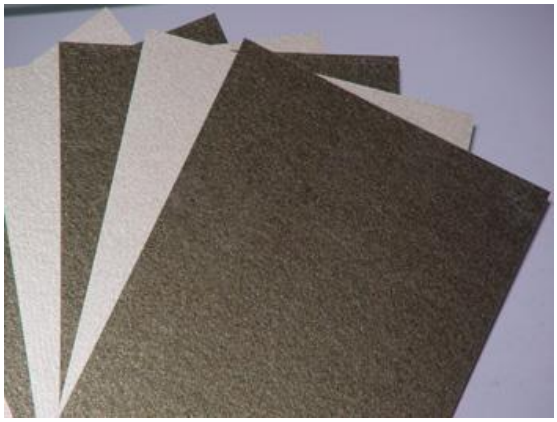
Application:

Anthracite is used as an appropriate heating fuel, burns hardly and at high temperatures, and if it burns, it creates a blue flame without smoke. This product is also used in water and sewage treatment.

# Refractories

(Mica Sheet, Ladle Outer Nozzle, Green Mortar, Ladle Filler Sand, Slide Gate, Ladle Inner Nozzle, Coated Sand, Tundish Nozzle, Chromite Sand, Casting Sand 161)

**Mica Sheet:**



| Mica Sheet | | | | | |
|---|---|---|---|---|---|
| **Item** | **Unit** | **Rigid Mica Sheet** | **Rigid Mica Sheet** | **Flexible Mica Sheet** | **Flexible Mica Sheet** |
| Mica Paper | | Muscovite | Phlogopite | Muscovite | Phlogopite |
| Mica Content | % | Ca.90< | Ca.90< | Ca.90< | Ca.90< |
| Bond Content | % | Ca.10> | Ca.10> | Ca.10> | Ca.10> |
| Density | /g | 1.6 - 2.45 | 1.6 - 2.45 | 1.6 - 2 | 1.6 - 2 |
| Continuous Services | | 500 - 550 | 700 - 750 | 500 - 550 | 700 - 750 |
| Heat Loss at 500 | % | 1> | 1> | 1> | 1> |
| Heat Loss at 700 | % | 2> | 2> | 2> | 2> |
| Flexural Strength | MPa | 180< | 140< | 1> | 1> |
| Water Absorption | % | 1> | 1> | - | - |
| Dielectric Strength | KV/mm | 20< | 20< | 15< | 15< |
| Insulation Resistance 23 | Ω.cm | 1017 | 1017 | - | - |
| Insulation Resistance 500 | Ω.cm | 1012 | 1012 | - | - |

**Ladle Outer Nozzle:**

| | | |
|---|---|---|
| **Chemical Properties** | $Al_2O_3$ | 80% |
| | C | 6% |
| **Physical Properties** | B.D. ($g/cm^3$) | 2.8 |
| | A.P. (%) | 12 |
| | C.C.S (Mpa) | 92 |

**Green Mortar:**

| | | |
|---|---|---|
| **Chemical Properties** | $Al_2O_3$ | ≥ 88% |
| | $SiO_2$ | 4-5% ≥ |
| | $Fe_2O_3$ | 0.5% ≥ |
| | CaO | 0.25 % ≥ |
| | $Cr_2O_3$ | 6-7% ≥ |

## Ladle Filler Sand:

## Products Table of Ladle Filler Sand:

| Ladle Filler Sand | | | | | |
|---|---|---|---|---|---|
| **Density** | **Moisture** | **C** | **$SiO_2$** | **$Cr_2O_3$** | **Softening Point** |
| $Gr/cm^3$ | Wt.% | Wt.% | Wt.% | Wt.% | C |
| | 0.5 > | 0.5 - 1 | 15 - 18 | 38 - 42 | 1700 < |

## Products Table of EBT Filler Sand:

| EBT Filler Sand | | | | | | |
|---|---|---|---|---|---|---|
| **Element** | **MgO** | **$SiO_2$** | **$Fe_2O_3$** | **CaO** | **$Al_2O_3$** | **Grain Size (mm)** |
| % | 45 - 60 | 38 - 42 | 7 - 9 | 0 - 0.5 | 0 - 0.4 | 2 - 6 |

**Slide Gate:**

| Slide Gate | | |
|---|---|---|
| Chemical Properties | $Al_2O_3$ | 88% |
| | C | 2% |
| Physical Properties | B.D. ($g/cm^3$) | 3.1 |
| | A.P. (%) | 8 |
| | C.C.S (Mpa) | 120 |

**Ladle Inner Nozzle:**

| | | |
|---|---|---|
| **Chemical Properties** | $Al_2O_3$ | 85% |
| | C | 6% |
| **Physical Properties** | B.D. ($g/cm^3$) | 2.9 |
| | A.P. (%) | 12 |
| | C.C.S (Mpa) | 90 |

**Coated Sand:**

**Description:**

Resin Sand 201:

- Suitable for coring in small and delicate sized with very high surface smoothness;
- Suitable for coring in medium and large sizes with high gas permeability.

Resin Sand 202:

- Suitable for coring with medium sizes and high strength.

**Tundish Nozzle:**

| | | Body | Zirconia Core |
|---|---|---|---|
| **Chemical Properties** | $Al_2O_3$ | 75% | - |
| | $ZrO_2$ | - | 96% |
| | C | 6% | - |
| **Physical Properties** | B.D. ($g/cm^3$) | 2.7 | 5.2 |
| | A.P. (%) | 20 | 14 |
| | C.C.S (Mpa) | 60 | 85 |

## Chromite Sand:

| Chromite Sand | | | |
|---|---|---|---|
| | | **Ch-1** | **Ch-2** |
| **Chemical Properties** | Cr2O3 | 53.2 ≤ | 54 ≤ |
| | MgO | 21.12 ≥ | 20.12 ≥ |
| | Fe2O3 | 18.53 ≥ | 19.53 ≥ |
| | $Al_2O_3$ | 3.96 ≥ | 4.96 ≥ |
| | SiO2 | 3.21 ≥ | 2.21 ≥ |
| | Moisture | 2 | 2 |
| **Physical Properties** | Shape | Semi-Round, Round | Semi-Round, Round |
| | Grain Size | 0 - 0.7 mm<br>0.2 - 7 mm<br>More than 98% | 0 - 0.7 mm<br>0.2 - 7 mm<br>More than 98% |
| | Flowability | 36° | 36° |
| | Bulk Density | 4.6~4.8 $gr/cm^3$ | 4.6~4.8 $gr/cm^3$ |
| | Packing | 25 ton flecon bag<br>1 kg poly<br>1 viny bag | 25 ton flecon bag<br>1 kg poly<br>1 viny bag |

**Casting Sand 161:**

| Sieve No. (µm) | Pan | 53 | 90 | 125 | 180 | 250 | 355 | 500 | 710 |
|---|---|---|---|---|---|---|---|---|---|
| Percentage of Accumulation on the Sieve | - | 0.7 > | 1 - 5 | 10 - 20 | 20-30 | 30-45 | 15-25 | 3> | - |

| Angular Coefficient | Sinter Point | Density | Color |
|---|---|---|---|
| 1.3 > | 1400 < | 2.68 | Yellowish White |

| L.O.I | MgO | CaO | $K_2O$ | $Al_2O_3$ | $Fe_2O_3$ | $SiO_2$ |
|---|---|---|---|---|---|---|
| 0 | 0.24 | 0.27 | 0.19 | 0.95 | 0.85 | 97.5 |

Description:

Application: Production of steel and cast iron parts with medium sizes.

# Base Metals

(Misch Metal, Magnesium Ingot, Metal Silicon, Zinc Ingot, Lead Ingot, Aluminum Ingot, Tin, Nickel)

**Misch Metal:**

| Misch Metal | | | | | | | |
|---|---|---|---|---|---|---|---|
| Element | TREAM | Ce/ TREAM | La/ TREAM | Fe | Mg | Size | Packing |
| Present | 98% | 52-60% | 34% | 0.5% | 0.2% | 500MGS ingot | Steel Drums |

Description:

Application:

Misch Metal is used almost in the preparation of all rare earth elements, because these elements are almost identical in most chemical reactions.

**Magnesium Ingot:**

| Magnesium Ingot | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Mg** | **Pb%** | **Ni** | **Fe** | **Cu** | **Sn** | **Si** | **Mn** | **Zn** | **Al** |
| Present | 94% | 0.0005 | 0.001 % | 0.005 | 0.005 | 0.005 | 0.01 | 0.01 | 0.01 | 0.01 |

Description:

Application:

Magnesium metal is a light metal with physical and mechanical properties. Automotive and aerospace industries, as major consumers of metal magnesium, are replacing steel and aluminum parts with lighter magnesium components to reduce vehicle power consumption. Magnesium is also used as an alloying element in the production of aluminum alloys.

**Metal Silicon:**

| Item | Standard Reference | Class | Nominal Zn% Content | 1 | 2 | 3 | 4 | 5 | 6 | Permitted Total Elements in Columns 1-6 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pb | Cd | Fe | Sn | Cu | Al | |
| 1 | JIS H2107 | Special Zinc Metal | 99.99 | 0.007 | 0.004 | 0.005 | - | - | - | 0.01 |

Description:

Application:

Silicon metal is widely used in melting alloy elements, as a reducing agent in many types of metal melting. For steel and casting, it has a high melting point, high heat resistance and high resistance, and is commonly used in electrical, metallurgical and chemical industries.

**Zinc Ingot:**


| Item | Standard Reference | Class | Nominal Zn% Content | 1 | 2 | 3 | 4 | 5 | 6 | Permitted Total Elements in Columns 1-6 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pb | Cd | Fe | Sn | Cu | Al | |
| 1 | JIS H2107 | Special Zinc Metal | 99.99 | 0.007 | 0.004 | 0.005 | - | - | - | 0.01 |
| 2 | JIS H2107 | Ordinary Zinc Metal | 99.97 | 0.02 | 0.005 | 0.01 | - | - | - | 0.03 |
| 3 | ISO 752 | Zn-3 | 99.95 | 0.03 | 0.01 | 0.02 | 0.001 | 0.002 | 0.01 | 0.05 |

Description:

Application:

About 12 million tons of zinc per year are produced annually, more than half consumed in the galvanizing industry, about 14 percent in zinc base alloys used in the casting industry, and 10 percent in the production of brass and bronze. A significant amount of each other is consumed on zinc rolling, and the rest is consumed in compounds such as zinc oxide and zinc sulfate.

**Lead Ingot:**

| Lead Ingot | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Pb%** | **Zn%** | **Sn%** | **Cu%** | **Sb%** | **Bi%** | **Ag%** | **Cd%** | **As%** | **Te%** | **Ca%** |
| Present | 99.987 | 0.0001 | 0.001 | 0.0011 | 0.0001 | 0.0074 | 0.0014 | 0.0004 | 0.0001 | 0.0001 | 0.0001 |

Description:

Application:

The largest lead consumption is in storage batteries. These batteries are important for transportation vehicles, telecommunications and electrical industries. Lead also acts as a lubricant in free cutting steels.

**Aluminum Ingot:**

Description:

Application:

An ingot is a piece of relatively pure material, which is usually a metal used properly for further processing. In steel making, this is the first stage among semi-finished casting products.

The flexibility, strength and light weight of aluminum are some of the properties that make aluminum appropriate in many different applications. Aluminum properties change when other metals are added. These other metals can provide strength, luminosity, lamination and more ductility to aluminum.

**Tin:**

**Description:**

**Application**:

Tin is an elemental chemical with the symbol Sn and number 50 on the atomic table. This silver-colored metal has a good malleability and is simply not oxidized and is resistant to corrosion. Tin is used in many alloys.

The good resistance of this metal to corrosion and erosion has made it used as a coat for other metals to prevent rust and corrosion, like tinning copper containers have long been common to prevent copper rust and the entry of toxic copper oxide into food.

Bronze is the first tin alloy that was made about 5,000 years ago when it was combined with copper and tin, initiating a period known as the Bronze Age in Human History. Pewter is one of the tin alloys used from the Bronze Age to the twentieth century to make flat dishes and plates. Tin forms more than 85% of the pewter volume, and the rest consists of copper, lead or kohl. One of the other tin alloys used as solder is composed of more than 60% tin and lead as the rest. A large proportion of tin usage is to cover steel to prevent rust and corrosion. Low toxicity of tin makes tin-coated metal containers used abundantly to store food.

Tin is a malleable, flexible, highly crystalline, and silver-white metal whose crystalline structure creates a specific sound when bending (due to the fracture of the crystals). This metal resists

erosion caused by distilled sea water and plumbing water but is attacked by strong acids, alkaline substances and acid salts. When oxygen dissolves, tin acts as a catalyst and accelerates chemical reactions. If it is heated in the presence of air tests, $Sn_2$ is obtained. $Sn_2$ is a weak acid and produces tin salts with basic oxides. Tin can be polished to a large extent and used to cover other materials in order to prevent erosion or other chemical reactions. This metal is directly combined with chlorine and oxygen and replaces hydrogen of diluted acids. Tin is flexible at normal temperatures, but it becomes fragile if heated.

**Nickel:**

Description:

Application:

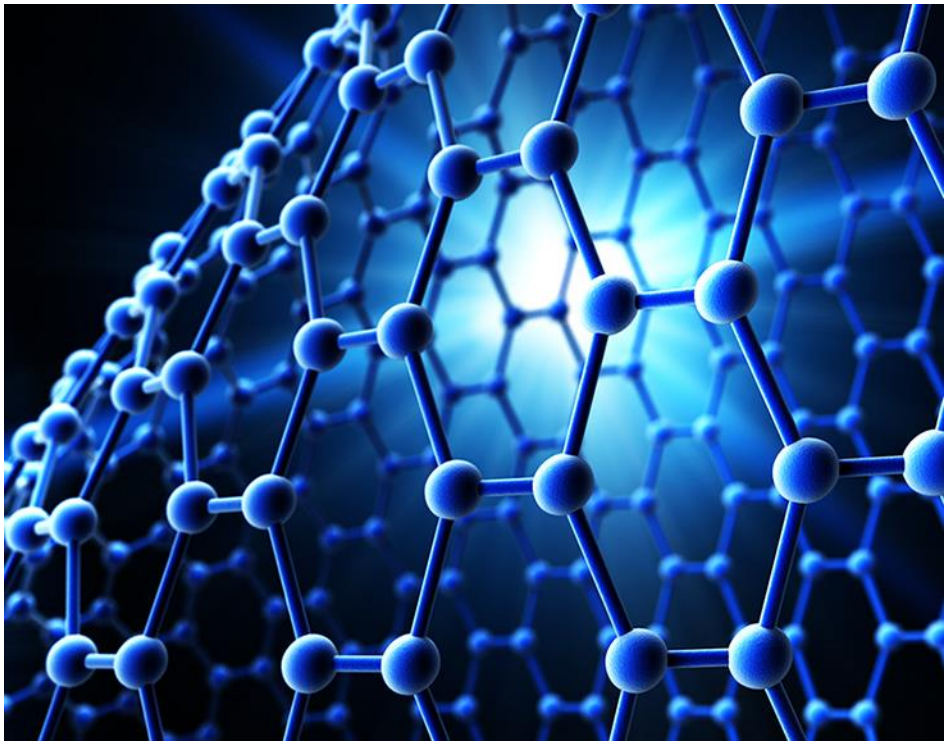
Nickel, with atomic number 28, is a resistant, malleable, relatively rare, and glossy metal with a crystalline and cube structure, which is white and silver. This element was discovered in 1751 by Swedish scientist Axel Cronstedt. In terms of magnetic properties and chemical activity, its is similar to iron and cobalt.

The main nickel minerals are Pentlandite, Pyrrhotite (nickel and iron sulfides) and Garnierite (nickel and iron silicate). Nickel is one of the main constituents of Meteorite. Iron and Siderite meteorites including iron alloys are about 5 to 20 percent of nickel. The commercial nickel is in the forms of Pentlandite and Pyrrhotite, and these mines are found in Ontario, Canada, which supplies about 30 percent of the world's nickel. Other mines of this element are in Caledonia, Australia, Cuba, Indonesia and other regions. This element is conductive and the surface is shiny and polished. This element is from the group of iron and cobalt elements and its alloys have high prices. It has many uses in nature and is used to make stainless steel and other anti-corrosive alloys such as Invar and Manel, which is an alloy with nickel and cobalt and resistant to corrosion and is used in Inconel and Hastelloys. It is used to make nickel and copper tubes and also to desalinate plants and convert saline water to liquid water. Nickel is used to make coins and nickel steel for armors and keys, and nickel can be used to make Nichrome alloy and Permalloy and a copper alloy. Nickel is used to make glass in green. Nickel plates can have a protective role for other metals. Nickel is also a catalyst for hydrogenation of vegetable oils.

Also, the ceramic industry and alloyed iron and nickel alloys have magnetism and Edison's batteries. Important nickel compounds are sulfate and oxide. Nickel is a mixture of five stable isotopes. Also, 9 other unstable isotopes are known. Nickel can exist both in metal and in solvent form. Steam is a nickel sulfide carcinogen, which should be carefully used when using it.

# Graphite

(Metallurgical Coke, Graphite)



**Metallurgical Coke:**

| Metallurgical Coke | | | | |
|---|---|---|---|---|
| **Size (mm)** | **FC%** | **Ash%** | **Mo%** | **VM%** |
| 0 - 3 | 70 - 75 | 20 - 25 | 3 max | 1.5 - 2.5 |
| 0 - 5 | 70 - 75 | 18 - 22 | 3 max | 1.5 - 2.5 |
| 0 - 10 | 75 - 80 | 16 - 20 | 3 max | 1.5 - 2.5 |
| 5 - 15 | 80 - 85 | 12 - 14 | 2 max | 1.5 - 2.5 |
| 10 - 20 | 81 - 86 | 14 - 16 | 2 max | 1.5 - 2.5 |
| 20 - 30 | 81 - 86 | 14 - 16 | 2 max | 1.5 - 2.5 |
| 30 < | 86 < | 10 | 0.6 max | 1.5 - 2.5 |

Description:

Application:

Coke in blast furnaces has different roles in energy supply, reducing iron ore, porosity for the passage of reducing gases and carburizing cast iron. In cupola furnaces, coke is also used as a fuel and a reducing agent. It should be noted that coke is also used in the casting industry

**Graphite:**

| Graphite | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Element** | | **VM** | **MOI** | **ASH** | **S** | **FC** | **Size** |
| Present | High Sulfur Graphite | 0.7% max | 0.5% max | 0.8% max | 0.5% max | 98.5% min | 1-5 mm |
| | Low Sulfur Graphite | 0.5% max | 0.5% max | 0.5% max | 0.04% max | 98.5% min | 1-5 mm |
| | Flake Graphite | 1.8% max | 0.5% max | 4% max | - | 95% min | 100MESH39.5%/+200MESH11.5 % +/-200MESH49% |

Description:

Application:

All types of graphite powders are used for carburizing to make alloy steels, slagging in electric arc furnaces, making ductile cast irons for use in induction furnaces and other industries. Low sulfur graphite powder is produced in different types of grading as well as different types of packaging, as requested and ordered.

# Minerals

(Calcium Carbonate, Fluorite, Quartz, Manganese Stone, Dolomite, Lime, Chromite, Iron Ore, Barite)

**Calcium Carbonate:**

| Calcium Carbonate | | | | | | |
|---|---|---|---|---|---|---|
| **Element** | **$SiO_2$** | **$Fe_2O_2$** | **CaO** | **$Na_2O$** | **$K_2O$** | **MnO** |
| Present | 0.1 | 0.1 | 55.09 | 0.08 | 0.01 | 43.09 |

**Fluorite:**

| Fluorine | | | | | |
|---|---|---|---|---|---|
| **Element** | **$CaF_2$** | **$CaO_3$** | **S** | **$SiO_2$** | **Size** |
| Present | 80 - 85 % | 8% max | 1% max | 8% max | 40-60 mm, 10-50 mm, 0-3 mm |

Description:

Application:

Fluorite is the most important fluorine mineral in nature from which fluorine can be obtained. The mineral is yellow, green, pink, blue, purple, colorless, and sometimes black, and crystallizes in the cubic system. It is semi-transparent and has a glassy gloss. The specific weight of this mineral is 18.3 and its hardness is 4. It usually fills the gap between other minerals and is more observed in nature as venous, and is associated with minerals of calcite, quartz, barite, celestine and sulfide. Fluorite has 7.48% fluorine and 3.51% calcium in a pure form. Due to its melting effect, Fluorite has many uses in metallurgy. Its applications include steel making, cast iron casting and iron alloys production.

**Quartz:**

| Quartz | | |
|---|---|---|
| **Element** | **SI** | **Size** |
| Present | 99% | Agglomerate |

**Manganese Stone:**

| Manganese Stone | | | | | | |
|---|---|---|---|---|---|---|
| **Element** | **Zn** | **$Al_2O_3$** | **$SiO_2$** | **P** | **Fe** | **Mn** |
| Present | <1 | <6 | <8 | <0.15 | <7 | >48 |

Description:

Application:

Manganese stone is mainly used for the production of ferromanganese, cast iron and steel. In addition to metallurgical applications, manganese also has many non-metallurgical applications, including natural or synthetic dioxides in dry and chemical batteries, sulfate and manganese sulfate oxides in animal feed, and plant-based fertilizer additives in agriculture, permanganate (as oxidizing agent), matchmaking industries , ceramics, glass and bricks, welding electrodes, ferro silicon manganese, ferrites production, water treatment, hydrometallurgy, fuel additives and other subsidiary applications.

**Dolomite:**

| Calcined Dolomite | | | | | | |
|---|---|---|---|---|---|---|
| **Element** | **$SiO_2$** | **$Al_2O_3$** | **$Fe_2O_3$** | **CaO** | **MgO** | **LOI** |
| Present | 1% max | 1% max | 1% max | 55-60 % | 36-39 % | 2-7 % |

| Dolomite | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Element** | **$SiO_2$** | **$Al_2O_3$** | **$Fe_2O_3$** | **CaO** | **MgO** | **$Na_2O$** | **$K_2O$** | **LOI** | **MnO** | **$P_2O_3$** |
| Present | 0.1 | 0.01 | 0.06 | 30.38 | 21.52 | 0.01 | 0.01 | 46.67 | - | - |

Description:

**Application**: Dolomite is used as the source of CaO and MgO in the metal melting industry (ferrous and non-ferrous).

The role of lime in addition to reducing the melting temperature is also important as the separator and collector of extra elements, including sulfur, phosphorus, aluminum and silica. For melting ores of some metals such as copper, lime is used. Lime, in addition to reducing the melting temperature, causes the absorption of $S_2O$ gas. In the production of aluminum by Bayer process, a significant amount of lime is consumed.

**Lime:**

| Lime | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Element** | **Fe** | **$SlO_2$** | **$Al_2O_3$** | **P** | **S** | **FeO** | **Size** |
| Present | 61% | 8% max | 2% max | 0.1 max | 0.02 max | 16% | 0-10 mm |

Description:

**Application**: Due to the inherent nature of lime and its high alkalinity and low price compared to other alkali, it has a large application in various industries, including the following:

- Steel, iron melting and metal industries
- Petrochemical Industries
- Building materials industries such as cement, ceramics, mosaics, stone powders, lime sand bricks
- Glass industry
- Drinking water and industrial water treatment
- Industrial and urban wastewater treatment
- Calcium Carbide Production
- Consumption in refractory products
- Coal mines (as explosive softener)

**Chromite:**

Description:

Application:

Chromite is a hard, fragile and silver-white metal discovered in 1798 by Vauquelin. This element, along with molybdenum and tungsten, is in the Group of 6 transition metals of the periodic table of elements. The chromium element is not found free in nature. The most important mineral containing chromium in the nature is chromite with $FeO.Cr_2O_3$ formula. From chromium, there are four natural isotopes as rC50, rC52, rC53, and rC54.

Chrome in the pure state at room temperature is a potentially soft element, but it is very difficult to produce pure chromium due to its strong trend to combine with oxygen, carbon, nitrogen, etc. The chromium used for polishing and plating gives the object luminance and bluish white color. The reflection power in the chrome-plated object is 77% of silver. The electrical conductivity of this element is 2.22% of copper.

The mechanical properties of chromium in relation to its strength and applicability include hardness, tensile strength, malleability, and rolling.

**Iron Ore:**

| Iron Ore | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Element** | **Fe** | **$SlO_2$** | **$Al_2O_3$** | **P** | **S** | **FeO** | **Size** |
| Present | 61% | 8% max | 2% max | 0.1 max | 0.02 max | 16% | 0-10 mm |

Description:

Application:

Iron ore is a metal element and covers 5% of the earth's crust. By extracting crude iron ore from the earth and separating impurities, the silver-brown iron dark powder is obtained.

This element is easily oxidized and not very strong on its own. To increase its strength, to be used in parts such as building construction, its alloy is made using many elements. These elements are different, and the most common are nickel and chromium.

**Barite:**

| Barite | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Element** | **$Pe_2O_3$** | **MnO** | **$Fe_2O_3$** | **$K_2O$** | **CaO** | **$Al_2O_3$** | **MgO** | **$Na_2O_3$** | **$SiO_2$** | **$SO_3$** | **BaO** |
| Present | n.d | n.d | 0.01 | 0.003 | 0.08 | 0.08 | n.d | 0.5 | 0.02 | 34.51 | 64.43 |

Description:

**Application**: Most of the barite products are used as fuller in drilling mud. These high-density muds cause the drill rod to go down, cut off particles to emit out from the middle and return the surface from the space between the rod and the wall. This fluid flow does two:

It cools down the drill bit.

The high-density mud removes the stones cut off by the drill and then carries them up to the surface.

Barite is also used as a pigment in paints and heavy fillers for paper, clothing and rubber. There is some barite among the paper fibers used in game cards. It gives a very high density to the paper that allows players to deal with cards easily. Barite is mainly barium ore, which causes a great deal of variation in barium compounds. One of its uses is X-ray protection. Barite has the ability to prevent emission of X-rays and gamma radiation out. Barite is used to construct high-density concrete to prevent emission of X-rays in hospitals, power plants and also laboratories.

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**Website Text and Policies:**

ETOK Sanat Rad Company, having 20 years of experience in the field of workshop, has started since 2018 with the aim of producing high quality products. We are committed to becoming the world's leading supplier of alloys for global markets.

The company started its activity with the belief that it can take a step towards the development of raw materials-related industries.

**Policies:**

- Providing high quality products;
- Performing research and development activities aimed at diversifying products and improving production processes;
- Improving human capital based on the competence, capability and performance evaluation fairly and accurately;
- Developing employees' knowledge through training;
- Attempting to meet legal and regulatory requirements in all aspects related to the organizational management system.

In order to gain these goals, senior management of the company is committed to putting all procedures, structures, individuals and financial resources together so that the expected results can be achieved in an effective time. Also, the qualitative goals of the company are determined within the framework of this policy, and the policy is periodically reviewed and revised at the management review meetings, and all personnel are expected to give generously their utmost efforts to work towards the implementation of the policy.

Sattar Esmaeil Beigi

CEO