MINERAL PRODUCTS

- FELDESPAR
- CAOLINITE
- BALL CLAY
- BENTONITE
- SILICA
- TALC
- ZIRCONIUM SILICATE
- FRIT
- TRIPOLY PHOSPHATE
- ZINC
- LEAD
- CHROMITE
- MANGANESE
- TITANIUM
- URANIUM
- LITHIUM
- COAL
- TIN
- TURQUOISE
- GYPSOM
- HALITE
- TOPAZ
- QUARTZ
- LIME
- BAUXITE
- MICA
- BARITE
- ASBESTOS
- PEARLITE
- GRANITE
- IRON ORE

MINERAL PRODUCTS

1. FELDSPAR

Feldspar, any of a group of aluminosilicate minerals that contain calcium, sodium, or potassium. Feldspars make up more than half of Earth's crust. In the classification of igneous rocks of the International Union of Geological Sciences (IUGS), the feldspars are treated as two groups: the alkali feldspars and the plagioclase feldspars. The alkali feldspars include orthoclase, microcline, sanidine, anorthoclase, and the two-phase intermixtures called perthite.

- **Usage:**

Feldspars are used widely in the glass and ceramics industries. Alkali feldspars are more commonly used commercially than plagioclase feldspars. Albite, or soda spar as it is known commercially, is used in ceramics. The feldspar-rich rocks larvikite and a few anorthosites are employed as both interior and exterior facing slabs. In addition, several feldspars are used as gemstones.

Feldspar are a class of rock-forming tectosilicate minerals that contains calcium, potassium or sodium and makes up more than half of the earth's core by weight. Its minerals are largely found in igneous, sedimentary and metamorphic rocks spread across different parts of the world.

Feldspar play pivotal roles in the production of fillers in the paint, rubber, adhesive and plastic industries. They are also used as fluxing agents in glass and ceramic applications.

Product analysis of "Farazkooh" mine in Yazd (in IRAN):

Sample	Sio۲%	Al۲o۳%	Fe۲o۳%	Tio۲%	%Cao	%Mgo	%Na۲o	%K۲o	So۳%	%LOI	%Mno	P۲o۵%
FKA	۷۲/۸۵	۱۲/۷۰	۰/۷۸	۰/۱۴	۰/۷۶	۰/۰۵	۰/۱۵	۱۰/۸۳	۰/۱۰	۰/۹۹	۰/۰۳	۰/۰۳
FN۱۰	۷۹/۸۴	۱۲/۰۳	۰/۴۲	۰/۰۵	۰/۵۲	۰/۱۵	۶/۳۵	۰/۲۳	۰.۰۲>	۰/۴۰	۰/۰۱	۰/۰۱
FN۱۱	۷۵/۸۰	۱۲/۰۰	۰/۸۸	۰/۰۶	۱/۴۳	۰/۶۲	۴/۷۰	۱/۲۵	۰.۰۲>	۲/۹۲	۰/۰۲	۰/۰۳
FN۱۲	۷۶/۶۷	۱۲/۷۵	۰/۵۵	۰/۱۲	۱/۴۰	۰/۲۲	۵/۷۳	۰/۸۳	۰.۰۲>	۱/۷۹	۰/۰۱	۰/۰۳

Detailed product specifications:

Mineral Analysis		
Major Phase	Anorthite	Albite
Minor Phase	Chlorite	Vermiculite
Color after sintering		
Fired whiteness	F3	
	Light gray	

Physical properties	F3
Density ($^{g}/_{cm^2}$)	1.633
Viscosity without STPP	11
Shrinkage (%) T=1160℃	2.43
Water Absorption (%)	0.8
Dry MOR($^{Kg}/_{cm^2}$)	-
T.E.C(0-400)	66
(L.O.I)% T=	3.5

Chemical Analysis

Sample	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	TiO_2 %	CaO %	MgO %	Na_2O %	K_2O %	SO_3 %	LOI %	MnO %	P_2O_5 %
F3	57.62	18.16	0.95	0.84	9.35	3.97	6.48	0.24	<0.01	2.09	0.02	0.11

About us

- Very low T.E.C
- Light gray fired color
- Suitable white filler for porcelain tiles
- Very good rheology

2. KAOLINITE

Kaolin, also called china clay, soft white clay that is an essential ingredient in the manufacture of china and porcelain and is widely used in the making of paper, rubber, paint, and many other products.

When kaolin is mixed with water in the range of 20 to 35 percent, it becomes plastic (i.e., it can be

molded under pressure), and the shape is retained after the pressure is removed. With larger percentages of water, the kaolin forms a slurry, or watery suspension. The amount of water required to achieve plasticity and viscosity varies with the size of the kaolinite particles and also with certain chemicals that may be present in the kaolin.

Analysis of "Arazgun Ai" mine product in East Azerbaijan (in IRAN):

Sample	P۲O۵%	MnO	% Loi	% SO۳	% K۲O	% Na۲O	% MgO	% CaO	% TiO۲	Fe۲O۳%	% Al۲O۳	% SiO۲
ARS	۰/۳۶	۰/۰۱	۶/۳۱	۰/۱	۲/۵۶	۱/۸۷	۰/۴۴	۰/۳۲	۰/۶۳	۱/۶۶	۲۱/۹۴	۶۳/۸۱
AR۱	۰/۱۲	۰/۰۱	۷/۱۲	۰/۱۹	۲/۳۸	۰/۸۵	۰/۳۹	۰/۳۶	۰/۶	۲/۳۵	۲۰/۴	۶۴/۹۱
AR۲	۰/۰۸	۰/۰۱	۷/۵	۰/۲۹	۲/۱۱	۱/۶۷	۰/۳۳	۰/۷۷	۰/۵۷	۳/۲۷	۱۸/۵۲	۶۴/۱۶

- **Usage:**

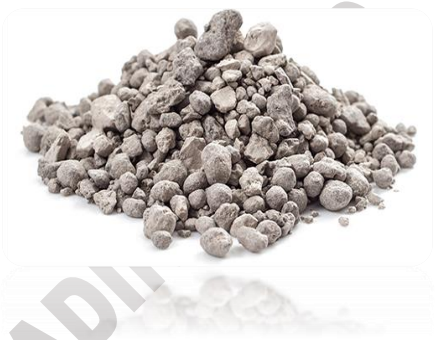
Approximately 40 percent of the kaolin produced is used in the filling and coating of paper. In filling, the kaolin is mixed with the cellulose fiber and forms an integral part of the paper sheet to give it body, color, opacity, and printability. In coating, the kaolin is plated along with an adhesive on the paper's surface to give gloss, color, high opacity, and greater printability. Kaolin used for coating is prepared so that most of the kaolinite particles are less than two micrometers in diameter.

Kaolin is used extensively in the ceramic industry, where its high fusion temperature and white burning characteristics makes it particularly suitable for the manufacture of whiteware (china), porcelain, and refractories. The absence of any iron, alkalies, or alkaline earths in the molecular structure of kaolinite confers upon it these desirable ceramic properties. In the manufacture of whiteware the kaolin is usually mixed with approximately equal amounts of silica and feldspar and a somewhat smaller amount of a plastic light-burning clay known as ball clay. These components are necessary to obtain the proper properties of plasticity, shrinkage, vitrification, etc., for forming and firing the ware. Kaolin is generally used alone in the manufacture of refractories.

Substantial tonnages of kaolin are used for filling rubber to improve its mechanical strength and resistance to abrasion. For this purpose, the clay used must be extremely pure kaolinite and exceedingly fine grained. Kaolin is also

used as an extender and flattening agent in paints. It is frequently used in adhesives for paper to control the penetration into the paper. Kaolin is an important ingredient in ink, organic plastics, some cosmetics, and many other products where it's very fine particle size, whiteness, chemical inertness, and absorption properties give it particular value.

3. BALL CLAY



Ball clays or plastic clays are fine grained, highly plastic sedimentary clays, which fire to a light or near white color. They are used mainly in the manufacture of ceramic whiteware and are valued for their key properties of plasticity, unfired strength and their light fired colour.

Ball clays exhibit highly variable compositions and consist of a mixture, primarily of kaolinite, mica and quartz, with each contributing different properties to the clay. The crystallinity of the key component, kaolinite, has a marked influence on ceramic performance.

Ball clay acts as a binding agent and contributes to plasticity, workability and strength in a pre-fired ceramic body. Some are highly valued for their fluid and casting properties, particularly in the manufacture of sanitaryware.

Ball clays are relatively scarce, globally because of the unusual combination of geological factors required for their formation and subsequent preservation.

Physical properties

- High plasticity
- Excellent workability
- High unfired strength
- Rheological stability
- Controlled residue
- Refractoriness

Damghan mine product analysis (in IRAN):

Sample	Sio۲%	Al۲o۳%	Fe۲o۳%	Tio۲%	Cao%	Mgo%	Na۲o%	K۲o%	So۳%	LOI%	Mno%	P۲o۵%
A۱	۶۴/۷۹	۲۱/۵۶	۰/۹۵	۰/۸۱	۰/۰۷	۰/۷۳	۰/۳۲	۳/۶۱	۰/۱۳	۶/۸۲	<۰/۰۱	۰/۱۱

Mineral Analysis	
1	Quartz
2	Muscovite- ilite
3	Kaolinite
Color after sintering	
Fired whiteness	A7
	Light Brown

Physical properties	A7
Density ($^{g}/_{cm^2}$)	1.65
Viscosity without STPP	58
Shrinkage (%) T=1160℃	5.7
Water Absorption (%)	0.14
Dry MOR($^{Kg}/_{cm^2}$)	16
T.E.C(25-500)	92
(L.O.I)% T=	8.3

Chemical Analysis

Sample	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	TiO_2 %	CaO %	MgO %	Na_2O %	K_2O %	SO_3 %	LOI %	MnO %	P_2O_5 %
A7	64.03	19.46	1.22	0.91	0.07	0.73	0.4	3.07	0.18	6.82	<0.01	0.11

About us

- Good shrinkage
- High dry strength (MOR)
- Cream fired color

- **Usage:**

Ball clay are almost entirely used as ceramic raw materials for sanitaryware, wall and floor tiles and tableware. It is combined with other ingredients such as kaolin, silica sand and flux and is a vital part of the mix even in small quantities.

Ball clay, or "plastic clay" as it is also known, is an extremely rare mineral, only found at a handful of locations around the world. It's a kaolinitic clay made up of 20–80% kaolinite, 10–25% mica, 6–65% quartz, as well as some organic matter.

Ball clays are prized for the production of ceramics products such as sanitaryware, tableware, tiles and large surfaces, as well as for technical ceramics and electrical porcelains.

Ball clays serve primarily to control casting and plastic properties of the ceramic body and to provide cohesion and workability during production processes.

In sanitaryware, ball clay is essential for shaping the final pieces. Its main characteristics are plasticity/strength, particle size distribution, low shrinkage and rheology.

In tableware, used with kaolin, feldspar and quartz, ball clay confers high plasticity and a good white-fired color to the end product.

In wall and floor tiles as well as large surfaces, ball clays are prized for their plasticity and bonding properties.

In englobes, ball clay gives the necessary adhesion to the ceramic piece to provide sufficient coverage of the body and ensure a perfect finish.

4. BENTONITE

Bentonites disperse into colloidal particles and, accordingly, provide large surface areas per unit weight of clay. This large surface area is a major reason why bentonite functions so well in stabilizing emulsions, or as a medium to carry other chemicals.

Bentonites react chemically with many organic materials to form compounds which are used chiefly as gelling agents in a variety of organic liquids.

Physical Properties of Bentonite that makes it so effective in Industrial Applications:

1. **Excellent colloidal properties**
2. **Whenever it comes into contact with water, it expands.**
3. **Water absorptions**
4. **Viscosity is high**
5. **Highly plasticity**
6. **Thixotropy**

- **Usage:**

Most industrial applications involve the swelling property of bentonite to form viscous water suspensions. Depending upon the relative proportions of clay and water, these mixtures are used as bonding, plasticizing, and suspending agents. Today, bentonite is used to make medicine and makeup. You can buy it in powders and pills, too. It's sometimes used in:

- **Shampoo**
- **Lotion**
- **Face masks**
- **Toothpaste**
- **Dietary supplements**

Bentonite greatly helps in preserving the quality of concrete in the substrate foundation, without the use of bentonite, soil particles can mix with the poured concrete, resulting in low-quality concrete. To reduce drilling friction, bentonite is used as a lubricant for piling machinery and hammers.

1. **Bentonite Application in Construction and Civil Engineering**

2. **Adding Bentonite in Cat Litter and Animal Feed**

3. **Bentonite Applications in Drilling Mud Industry**

4. **Bentonite for Drill Holes and Earthing Projects**

5. **Bentonite Applications in Iron Ore Palletizing Industry**

6. **Bentonite Applications in the Paper Industry**

The applications of Bentonite in several industries are expected to expand in the coming years as demand rises for green molding, casting processes, oil drilling, pelletizing, and cat litter applications.

5. SILICA

Silica is one of the most common minerals in the earth's crust. Glass, beach sand, silicone, and granite are all silica materials. There are two forms of silica – crystalline and noncrystalline.

The most common form of crystalline silica is quartz, which is found in sand, gravel, clay, granite, diatomaceous earth, and many other forms of rock. Non-crystalline silica is found in glass, silicon carbide, and silicone. These materials are much less hazardous to the lungs.

When we talk about silica exposure we are talking about crystalline silica or quartz. Construction workers could be exposed to silica when cutting, grinding, drilling, sanding, mixing, or demolishing materials containing silica.

- **Usage:**

About 95% of the commercial use of silicon dioxide (sand) occurs in the construction industry, e.g. for the production of concrete

Certain deposits of silica sand, with desirable particle size and shape and desirable clay and other mineral content, were important for sand casting of metallic products.

The high melting point of silica enables it to be used in such applications such as iron casting; modern sand casting sometimes uses other minerals for other reasons. Crystalline silica is used in hydraulic fracturing of formations which contain tight oil and shale

gas. Silica, either colloidal, precipitated, or pyrogenic fumed, is a common additive in food production. It is used primarily as a flow or anti-caking agent in powdered foods such as spices and non-dairy coffee creamer, or powders to be formed into pharmaceutical tablets. It can adsorb water in hygroscopic applications. Colloidal silica is used as a fining agent for wine, beer, and juice. In cosmetics, silica is useful for its light-diffusing properties and natural absorbency.

INDUSTRIAL & METALLURGICAL APPLICATIONS

- **Water filtration and purification**
- **Filler sand**
- **Foundry sand**
- **Specialised flooring solutions**
- **Refractories**
- **Glass manufacturing**
- **Paints and wall coatings**
- **Silica flux**

CONSTRUCTION & MINING

- **Tiles manufacturing**
- **Grouts, adhesive, epoxy and specialised cements**
- **Drilling**
- **Sand blasting**

RECREATIONAL

- **Playpen and other sands**
- **Landscaping**
- **Aquariums and ponds**
- **Swimming pool filtration**

6. TALC

Talc is a naturally occurring mineral, mined from the earth, composed of magnesium, silicon, oxygen, and hydrogen. Talc, or talcum, is a clay mineral, composed of hydrated magnesium silicate with the chemical formula $Mg_3Si_4O_{10}(OH)_2$

Talc in powdered form, often combined with corn starch, is used as baby powder. This mineral is used as a thickening agent and lubricant. It is an ingredient in ceramics, paints, and roofing material. It is a main ingredient in many cosmetics.

The Mohs scale of mineral hardness, based on scratch hardness comparison, defines value 1 as the hardness of talc, the softest mineral. When scraped on a streak plate, talc produces a white streak; although this indicator is of little importance, because most silicate minerals produce a white streak. Talc is translucent to opaque, with colors ranging from whitish gray to green with a vitreous and pearly luster. Talc is not soluble in water, and is slightly soluble in dilute mineral acids.

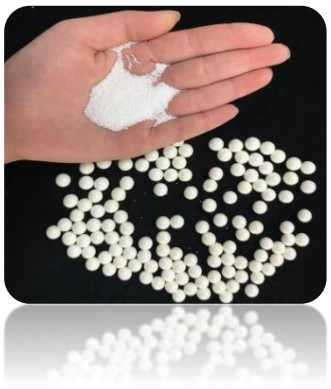
- **Usage:**

Talc is used in many industries, including paper making, plastic, paint and coatings (e.g. for metal casting molds), rubber, food, electric cable, pharmaceuticals, cosmetics, and ceramics. A coarse grayish-green high-talc rock is soapstone or steatite, used for stoves, sinks, electrical switchboards, etc. It is often used for surfaces of laboratory table tops and electrical switchboards because of its resistance to heat, electricity, and acids. In finely ground form, talc finds use as a cosmetic (talcum powder), as a lubricant, and as a filler in paper manufacture. It is used to coat the insides of inner tubes and rubber gloves during manufacture to keep the surfaces from sticking. Talcum powder, with heavy refinement, has been used in baby powder, an astringent powder used to prevent diaper rash (nappy rash). The American Academy of Pediatrics recommends that parents avoid using baby powder because it poses a risk of respiratory problems, including breathing trouble and serious lung damage if inhaled. The small size of the particles makes it difficult to keep them out of the air while applying the powder. Zinc oxide-based ointments are a much safer alternative. Soapstone (massive talc) is often used as a marker for welding or metalworking.

Due to its low shear strength, talc is one of the oldest known solid lubricants. Also, limited use is made of talc as a friction-reducing additive in lubricating oils.

Talc is widely used in the ceramics industry in both bodies and glazes. In low-fire art-ware bodies, it imparts whiteness and increases thermal expansion to resist crazing. In stonewares, small percentages of talc are used to flux the body and therefore improve strength and vitrification. It is a source of MgO flux in high-temperature glazes (to control melting temperature). It is also employed as a matting agent in earthenware glazes and can be used to produce magnesia mattes at high temperatures.

7. ZIRCONIUM SILICATE



Zirconium silicate, also zirconium orthosilicate, $ZrSiO_4$, is a chemical compound, a silicate of zirconium. It occurs in nature as zircon, a silicate mineral. Zirconium silicate is usually colorless, but impurities induce various colorations.

It is insoluble in water, acids, alkali and aqua regia. Hardness is 7.5 on the Mohs scale.

- **Usage:**

The major applications exploit its refractory nature and resistance to corrosion by alkali materials. Two end-uses are for enamels, and ceramic glazes. In enamels and glazes it serves as an opacifier. It can be also present in some cements.

Another use of zirconium silicate is as beads for milling and grinding.

Thin films of zirconium silicate and hafnium silicate produced by chemical vapor deposition, most often MOCVD, can be used as a high-k dielectric as a replacement for silicon dioxide in semiconductors.

Zirconium silicates have also been studied for potential use in medical applications. For example, ZS-9 is a zirconium silicate that was designed specifically to trap potassium ions over other ions throughout the gastrointestinal tract.

8. FRIT

A frit is a ceramic composition that has been fused, quenched, and granulated.

Frits form an important part of the batches used in compounding enamels and ceramic glazes; the purpose of this pre-fusion is to render any soluble and/or toxic components insoluble by causing them to combine with silica and other added oxides. However, not all glass that is fused and quenched in water is frit, as this method of cooling down very hot glass is also widely used in glass manufacture.

- **Usage:**

The frit is finely ground to form a ready-made powder coating before being used as a low-temperature coating which is usually prepared from raw materials, lead and borax or from a combination of both. Frit is used to prepare low temperature firing colors and glazes.

In the ceramic industry, frit is used to prepare low-temperature glazes to replace the toxic lead and borax raw materials which is an aqueous solution or used to prepare colors on glazes 650-750 °Cand used in the preparation of colors

There are many types of frits made for use in other industries with different firing temperatures.

The types of frit used in the ceramic industry can be divided into 4 types:

1. **Lead Frit**
2. **Lead and Boron Frit**
3. **Borax Frit Borosilicate clear coated, no lead**
4. **Borosilicate frit coated solid white, no lead**

9. TRIPOLY PHOSPHATE

Sodium triphosphate (STP), also sodium tripolyphosphate (STPP), or tripolyphosphate (TPP) is an inorganic compound with formula $Na_5P_3O_{10}$

It is the sodium salt of the polyphosphate penta-anion, which is the conjugate base of triphosphoric acid.

It is produced on a large scale as a component of many domestic and industrial products, especially detergents. Environmental problems associated with eutrophication are attributed to its widespread use.

- **Usage:**

Sodium tripolyphosphate (STPP) — is widely used as a component for the production of synthetic detergents, water treatment, as well as in the ceramic, paint, varnish and other industries.

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STPP is a preservative for seafood, meats, poultry, and animal feeds.

Other uses (hundreds of thousands of tons/year) include ceramics (decrease the viscosity of glazes up to a certain limit), leather tanning (as masking agent and synthetic tanning agent - SYNTAN), anticaking agents, setting retarders, flame retardants, paper, anticorrosion pigments, textiles, rubber manufacture, fermentation, antifreeze."

TPP is used as a polyanion crosslinker in polysaccharide based drug delivery. Toothpaste may contain sodium triphosphate.

10. ZINC

Zinc is a lustrous bluish-white metal. It is found in group IIb of the periodic table. It is brittle and crystalline at ordinary temperatures, but it becomes ductile and malleable when heated between 110°C and 150°C. It is a fairly reactive metal that will combine with oxygen and other non-metals, and will react with dilute acids to release hydrogen.

- **Usage:**

Most zinc is used to galvanise other metals, such as iron, to prevent rusting. Galvanised steel is used for car bodies, street lamp posts, safety barriers and suspension bridges. Large quantities of zinc are used to produce die-castings, which are important in the automobile, electrical and hardware industries. Zinc is also used in alloys such as brass, nickel silver and aluminium solder.

Zinc oxide is widely used in the manufacture of very many products such as paints, rubber, cosmetics, pharmaceuticals, plastics, inks, soaps, batteries, textiles and electrical equipment. Zinc sulfide is used in making luminous paints, fluorescent lights and x-ray screens.

11. LEAD

Lead (Pb), a soft, silvery white or grayish metal in Group 14 (IVa) of the periodic table. Lead is very malleable, ductile, and dense and is a poor conductor of electricity. It is a heavy metal that is denser than most common materials.

- **Usage:**

Lead is widely used for car batteries, pigments, ammunition, cable sheathing, weights for lifting, weight belts for diving, lead crystal glass, radiation protection and in some solders.

There are various uses of lead which are as follows:

It may be used as a pure metal, as a chemical mixture, and alloyed with other metals. It is used for the lead acid storage battery. It is used in the building industry for lightning up or crumbling to turn aside water penetration.

It is used for lead pipes, pigments, cable sheathing, lead alloys, lead weights for scuba diving, ammunition, lead crystal glass, radiation protection, and car batteries.

It is used to make bearings, solder, and type metal. It is frequently used to store abrasive liquids.

It is used for soldering parts of electrical equipment. Lead is used in alloys as an element in copper and steel.

12. Chromite

Chromite is important because it is the only economic ore of chromium, an essential element for a wide variety of metal, chemical, and manufactured products.

Chromite is a crystalline mineral composed primarily of iron (II) oxide and chromium (III) oxide compounds.
It can be represented by the chemical formula of FeCr2O4. It is an oxide mineral belonging to the spinel group. The element magnesium can substitute for iron in variable amounts as it forms a solid solution with magnesiochromite ($MgCr_2O_4$). A substitution of the element aluminum can also occur, leading to hercynite ($FeAl_2O_4$).

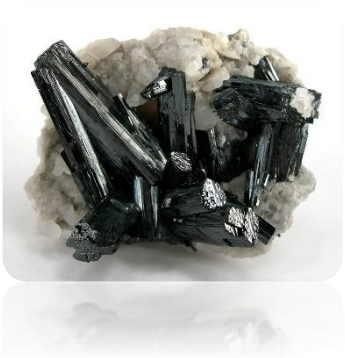
Chromite today is mined particularly to make stainless steel through the production of ferrochrome (FeCr), which is an iron-chromium alloy. Chromite is iron-black in color with a metallic luster, a dark brown streak and a hardness on the Mohs scale of 5.5

- **Usage:**

Chromium is a metal used to induce hardness, toughness, and chemical resistance in steel. The alloy produced is known as "stainless steel." When alloyed with iron and nickel, it produces an alloy known as "nichrome" which is resistant to high temperatures and used to make heating units, ovens, and other appliances. Thin coatings of chromium alloys are used as platings on

auto parts, appliances, and other products. These are given the name "chrome plated." It is also used to make superalloys that can perform well in the hot, corrosive, and high-stress environment of jet engines. Chromium's name comes from the Greek word "chroma" which means "color." Chromium is used as a pigment in paint. The familiar yellow lines painted down the center of highways and the yellow paint used on school buses are often "chrome yellow" - a color produced from chromium pigment. Chromium is an important pigment in many types of paint, ink, dye, and cosmetics. Trace amounts of chromium produce the color in many minerals and gemstones. The red color of ruby, the pink of some sapphires, and the green color of emerald are caused by tiny amounts of chromium. Chromite is used as a refractory in the production of steel, copper, glass and cement. The chromite mineral is an iron chromium oxide. The chromite mineral is the primary source of chromium metal with applications in hard rustles steel, anodizing of aluminum, super refractory bricks, wood preservative, leather tanning, and catalysts for hydrocarbon processing. The health hazards associated with exposure to chromium metal are dependent on its oxidation state. The metal form of chromium, as it exists in this product, is of low toxicity. However, the chromite with hexavalent form is toxic.

13. MANGANESE



Manganese combined with other elements is widely distributed in Earth's crust. Manganese is second only to iron among the transition elements in its abundance in Earth's crust; it is roughly similar to iron in its physical and chemical properties but is harder and more brittle. It occurs in a number of substantial deposits, of which the most important ores (which are mainly oxides) consist primarily of manganese dioxide (MnO_2) in the form of pyrolusite, romanechite, and wad. Manganese is essential to plant growth and is involved in the assimilation of nitrates in green plants and algae.

- **Usage:**

Manganese has many important applications in modern society. One of its primary uses is in the production of steel, where it acts as a deoxidizer and desulfurizer, improving the strength and toughness of the steel. Manganese is

also used in the production of batteries, such as alkaline and rechargeable batteries, due to its high electrochemical activity. Additionally, manganese is used as a pigment in paints, as a component in fertilizers to improve plant growth, and as a nutritional supplement in animal feed and human diets. It is mainly used to decolourize glass and to prepare violet-coloured glass. Manganese sulphate is used to make a fungicide.

14. TITANIUM

Titanium is a lightweight, strong, corrosion-resistant, and biocompatible metal with a wide range of industrial applications due to its unique properties.

Mechanical Properties:

Strength: Titanium has a high strength-to-weight ratio, which makes it stronger than many other metals while being lightweight. It has excellent tensile strength, fatigue strength, and toughness.

Ductility: Titanium is moderately ductile, meaning it can be drawn into wires or hammered into thin sheets without breaking.

Hardness: Titanium is a relatively hard metal with a Mohs hardness of 6, which makes it resistant to wear and abrasion.

- **Usage:**

Titanium has a wide range of uses and applications due to its unique properties, which include its high strength-to-weight ratio, excellent corrosion resistance, and biocompatibility. Some of the main uses and applications of titanium are:

* **Aerospace and Aviation: Titanium is widely used in aerospace and aviation industries due to its high strength-to-weight ratio. It is used in aircraft components such as airframes, engine components, landing gears, and fasteners. Titanium's lightweight nature helps to**

reduce fuel consumption and increase efficiency in aerospace applications.

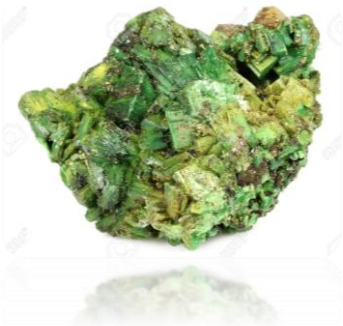
- **Industrial: Titanium is used in a variety of industrial applications due to its excellent corrosion resistance. It is used in chemical processing equipment, desalination plants, power generation equipment, and offshore oil and gas platforms. Titanium's corrosion resistance allows it to withstand harsh environments and corrosive chemicals, making it highly suitable for such applications.**
- **Medical and Dental: Titanium is widely used in medical and dental applications due to its biocompatibility, meaning it is well tolerated by the human body. It is used in surgical implants, such as joint replacements, dental implants, and pacemaker cases, due to its ability to integrate with human bone and tissue without causing adverse reactions.**
- **Sports and Recreation: Titanium is used in sports and recreational equipment due to its high strength-to-weight ratio and durability. It is used in sports equipment such as golf clubs, tennis rackets, bicycle frames, and diving knives, where lightweight and strong materials are desired.**
- **Consumer Goods: Titanium is used in consumer goods such as watches, jewelry, eyeglass frames, and mobile phones due to its attractive appearance, durability, and resistance to corrosion and tarnish.**
- **Military and Defense: Titanium is used in military and defense applications due to its high strength-to-weight ratio, corrosion resistance, and ability to withstand extreme conditions. It is used in armor plating, military aircraft components, naval vessels, and missile parts.**
- **Automotive: Titanium is used in high-performance automotive applications, such as exhaust systems, suspension components, and engine valves, due to its lightweight and high-temperature resistance properties, which can improve fuel efficiency and performance.**
- **Sports Medicine: Titanium is used in sports medicine for implants, prosthetics, and orthopedic devices due to its biocompatibility, strength, and durability.**

* **Electronics: Titanium is used in electronics, particularly in the aerospace and defense industries, due to its high strength, lightweight nature, and resistance to extreme temperatures.**
* **Other Applications: Titanium is also used in various other applications, such as in the production of pigments for paints, coatings, and plastics, as a catalyst in chemical reactions, in the aerospace industry for rocket components, and in the production of high-performance sports equipment.**

The unique combination of properties possessed by titanium makes it a valuable material in a wide range of applications across various industries. Its high strength, low density, excellent corrosion resistance, biocompatibility, and other properties make it a preferred choice in many demanding and specialized applications.

15. URANIUM

Uranium ore refers to naturally occurring rock or mineral deposits that contain a sufficient concentration of uranium, a radioactive element, to make its extraction economically viable. Uranium is a relatively rare element and is typically found in trace amounts in the Earth's crust. Uranium ore is typically mined and processed to extract uranium for various purposes, including nuclear power generation, production of nuclear weapons, medical and industrial applications, and scientific research. The extraction and processing of uranium ore involve specialized techniques and precautions due to the radioactive nature of uranium and its potential environmental and health risks.



- **Usage:**

Uranium and its products have various uses in different industries and applications. Some of the main uses of uranium and uranium products include:

Nuclear power generation: Uranium is primarily used as fuel in nuclear power reactors to generate electricity. Uranium is a highly efficient energy source and

can produce large amounts of electricity with relatively low carbon emissions compared to fossil fuels. Uranium fuel is used in nuclear reactors to produce heat, which is then used to generate steam and drive turbines to produce electricity.

Nuclear weapons: Uranium is used as a key component in the production of nuclear weapons. Uranium-235, a rare isotope of uranium, is highly enriched to create weapons-grade uranium for use in nuclear bombs and other weapons of mass destruction.

Medical applications: Uranium and its isotopes are used in various medical applications, such as cancer treatments, diagnostics, and radiography. Uranium isotope U-238 is used as a target material in the production of medical radioisotopes, which are used for imaging, diagnostics, and therapy in the field of nuclear medicine.

Industrial applications: Uranium is used in several industrial applications, such as in the production of colored glass, ceramic glazes, and specialty alloys. Uranium is also used as a catalyst in some chemical processes, and in the manufacturing of certain types of electrical and electronic equipment.

Research and development: Uranium is used in research and development activities, including in nuclear physics experiments, radiation detection and measurement, and as a tracer in various scientific studies. Uranium isotope U-238 is also used in radiometric dating techniques to determine the age of rocks, minerals, and archaeological artifacts.

16. LITHIUM

Lithium (Li) ore is a type of rock or mineral that contains significant concentrations of lithium, a soft, silver-white alkali metal with the atomic number 3 and symbol Li on the periodic table. Lithium is known for its unique properties, such as being the lightest metal, having the highest electrochemical potential, and being highly reactive with water.

Lithium is a critical element used in various applications, especially in the production of rechargeable batteries, which are used in a wide range of devices such as electric vehicles, smartphones, laptops, and energy storage systems. Additionally, lithium is also used in other industries, including aerospace, ceramics, glass, and pharmaceuticals.

- **Usage:**

The most important use of lithium is in rechargeable batteries for mobile phones, laptops, digital cameras and electric vehicles. Lithium is also used in some non-rechargeable batteries for things like heart pacemakers, toys and clocks.

Lithium metal is made into alloys with aluminum and magnesium, improving their strength and making them lighter. A magnesium-lithium alloy is used for armor plating. Aluminum-lithium alloys are used in aircraft, bicycle frames and high-speed trains.

Lithium oxide is used in special glasses and glass ceramics. Lithium chloride is one of the most hygroscopic materials known, and is used in air conditioning and industrial drying systems (as is lithium bromide). Lithium stearate is used as an all-purpose and high-temperature lubricant. Lithium hydride is used as a means of storing hydrogen for use as a fuel.

17. COAL

Coal is a non-clastic sedimentary rock. They are the fossilized remains of plants and are in flammable black and brownish-black tones.

Its main element is carbon, but it can also contain different elements such as hydrogen, sulfur and oxygen. Unlike coal minerals, it does not have a fixed chemical composition and crystal structure. Depending on the type of plant material, varying degrees of carbonization and the presence of impurities, different types of coal are formed. Lignite is the lowest grade and is the softest and least charred. Sub-bituminous coal is dark brown to black. Bituminous coal is the most abundant and is often burned for heat generation. Anthracite is the highest grade and most metamorphosed form of coal. It contains the highest

percentage of low-emission carbon and would be an ideal fuel if it weren't for comparatively less.

- **Usage:**

Coal is primarily used as fuel to generate electric power. In coal-fired power plants, bituminous coal, subbituminous coal, or lignite is burned. The heat produced by the combustion of the coal is used to convert water into high-pressure steam, which drives a turbine, which produces electricity. In 2019, about 23 percent of all electricity in the United States was generated by coal-fired power plants, according to the U.S. Energy Information Administration. Certain types of bituminous coal can also be used in making steel. Coal used for steel making needs to be high in carbon content and low in moisture, ash, sulfur, and phosphorous content. Coal that meets these specifications is known as metallurgical coal. Coal also has a myriad of other uses, including in cement production, carbon fibers and foams, medicines, tars, synthetic petroleum-based fuels, and home and commercial heating.

18. TIN

Tin is a white metal at room temperature which is soft and highly rust-resistant and fatigue-resistant.

Tin is non-toxic and highly malleable (able to be shaped). Tin alloys easily with other metals, has a low melting point and is easy to recycle.

- **Usage:**

Tin and tin products have a wide range of uses across various industries. Tin is a versatile metal that possesses desirable properties, such as low toxicity, high corrosion resistance, and excellent solderability, which make it suitable for a variety of applications. Here are some common uses of tin and tin products:

1. **Soldering: Tin is widely used in the electronics industry for soldering applications. Tin-based solder alloys, such as tin-lead and tin-silver, are used for joining electrical components and circuit boards in electronic devices, such as computers, smartphones, televisions, and automotive electronics. Tin's low melting point and excellent wetting properties**

make it an ideal material for creating reliable electrical connections in electronic assemblies.

2. Packaging: Tin is used for making tinplate, which is a thin sheet of steel coated with a layer of tin. Tinplate is used for manufacturing tin cans, containers, and other packaging materials for food and beverages. Tin's corrosion resistance and ability to protect the contents of the container from air and moisture make it ideal for preserving food and maintaining its freshness.
3. Alloys: Tin is used as an alloying element in various alloys to improve their properties. For example, tin is used in the production of bronze, which is an alloy of tin and copper. Bronze is used for making statues, sculptures, and decorative items due to its attractive appearance, high corrosion resistance, and durability. Tin is also used in the production of bearing alloys, such as Babbitt metal, which is used in engine bearings for its low friction and wear properties.
4. Coatings: Tin coatings are used for a variety of applications. Tin-plated steel is used in the production of cans, containers, and other packaging materials due to its corrosion resistance and ability to protect the underlying material from rust. Tin coatings are also used in the production of electrical connectors and components for their low contact resistance and corrosion resistance properties.
5. Chemicals: Tin is used in the production of various chemicals, including organotin compounds, which are used as stabilizers in the production of PVC (polyvinyl chloride) plastics. Organotin compounds are also used as catalysts, biocides, and heat stabilizers in various industrial applications, including plastics, paints, and coatings.
6. Other Applications: Tin has several other applications, such as in the production of pewter, which is used for making decorative items, utensils, and other consumer goods. Tin is also used in the production of certain types of glass, ceramics, and specialized alloys for aerospace and defense applications. Tin-based solders are also used in plumbing and HVAC (heating, ventilation, and air conditioning) applications.

In summary, tin and tin products are used in a wide range of applications, including soldering, packaging, alloys, coatings, chemicals, and other specialized applications. Tin's desirable properties, such as low toxicity, high corrosion resistance, and excellent solderability, make it a versatile and valuable metal for various industries.

19. TURQUOISE

Turquoise is an opaque, blue-to-green mineral that is a hydrated phosphate of copper and aluminium.

This mineral usually occurs in massive or microcrystalline forms, as encrustations or nodules, or in veins. Crystals are rare; when found, they occur as short, often transparent prisms. Turquoise varies in color from sky-blue to green, depending on the amount of iron and copper it contains. Turquoise occurs in arid environments as a secondary mineral probably derived from the decomposition of apatite and some copper sulfides. It is uncommon and precious in the finer grades and has been offered as gemstone and ornamental stones for hundreds of years because of its unique tone.

- **Usage:**

Turquoise is primarily used as a decorative gemstone and has been prized by civilizations for thousands of years. Turquoise uses are as creative as they are widespread. For instance, one turquoise processor in Arizona actually makes tiles out of the stone for use in custom construction. It's not a cheap option though, such tiles cost hundreds of dollars per square foot.

In the Middle East, turquoise was used to adorn the top of domed buildings and represented religious significance.

Most people however, associate turquoise history with two things, jewelry and metaphysical beliefs. While cultures around the world have been producing turquoise jewelry for centuries, the Native Americans of the Southwest are considered the masters of making turquoise jewelry.

The other widely known turquoise uses are a bit more spiritual in nature. In different parts of the world, cultures ascribe certain metaphysical properties to turquoise. The New Age crowd believes the stone can promote positivity and drive away negative energy.

20. GYPSUM

Gypsum is an evaporite mineral most commonly found in layered sedimentary deposits in association with halite, anhydrite, sulfur, calcite, and dolomite. Gypsum ($CaSO_4.2H_2O$) is very similar to Anhydrite ($CaSO_4$). The chemical difference is that gypsum contains two waters and anhydrite is without water. Gypsum is the most common sulfate mineral.

- **Usage:**

Gypsum, also known as calcium sulfate hydrate, is a naturally occurring mineral found in layers of sedimentary rock all over the world. It is formed by the evaporation and replenishment of waters containing calcium and sulfates. White or gray in color, gypsum can be ground into a fine powder and boiled until the majority of its moisture is removed — a process known as calcination. Adding the water back to this powder creates a pliable substance that can be formed into a shape or mold and will harden to hold that form, or the substance can be added to other materials to bind them together. Because of its binding abilities, gypsum is a primary ingredient in some toothpastes. It is also used as plaster to create surgical casts; as an additive in many foods, like canned vegetables, ice cream and tofu; and as an amendment, conditioner and fertilizer for agricultural applications.

Other uses of gypsum include:

* **For settling particles in ponds**
* **For creating drywall, wallboard or plasterboard**
* **As molds for dinnerware, car windows and dental impression plasters**
* **As a hardening element in Portland cement**
* **In roads and highways**
* **As sidewalk or classroom chalk**
* **In hair products, like shampoo, and creams**

Although gypsum plays an important role in our lives and is found in many of our homes, food and hygiene products, many people do not know much about this mineral or even that it exists at all.

21. SALT

Salt (NaCl), sodium chloride, mineral substance of great importance to human and animal health, as well as to industry. Halite commonly known as rock salt, is a type of salt, the mineral (natural) form of sodium chloride (NaCl). Halite forms isometric crystals.

The mineral is typically colorless or white, but may also be light blue, dark blue, purple, pink, red, orange, yellow or gray depending on inclusion of other materials, impurities, and structural or isotopic abnormalities in the crystals. It commonly occurs with other evaporite deposit minerals such as several of the sulfates, halides, and borates.

- **Usage:**

Also nowadays, the most direct usage of it is in chloride and sodium hydroxide (caustic soda) producing industries:

Tannery and textile industries

Drilling mud (through increasing density and stability)

Production of aluminum (avoiding impurity)

Rubber production (separating rubber from latex)

Detergent production (filler)

Soap production (separating soap from glycerol)

Resin retrieval (using 10% brine, boilers)

Water softening and producing soft water

And many other industries…

As a result, refined salt cannot be a suitable substitution for salt regarding taste and trace elements it contains.

22. TOPAZ

Topaz is a silicate mineral and a member of the aluminum silicate family. It is renowned for its dazzling array of colors, including shades of blue, yellow, pink, brown, and more.

Among these, blue topaz is particularly popular in jewelry. It has a hardness of 8 on the Mohs scale, making it quite durable and suitable for various jewelry applications.

- **Usage:**

* **Jewelry and Ornamental Use**
* **Industrial Applications:**

Abrasives: Due to its hardness, topaz is used as an abrasive material in various industrial applications. It is employed for cutting, grinding, and polishing hard materials.

Optics and Electronics: Colorless and transparent topaz can be used as a material for certain optical components, such as lenses and prisms, due to its high refractive index and transparency to certain wavelengths of light.

Heat-Resistant Windows: Topaz's resistance to heat and temperature changes makes it suitable for certain applications in which heat-resistant windows or protective covers are needed.

Scientific Instruments: Topaz can be used in scientific instruments, such as X-ray spectroscopy systems, where its properties are advantageous for precise measurements.

* **Collecting and Investment:**

While certain rare and high-quality topaz varieties can appreciate in value over time, investing in gemstones requires careful consideration and expert guidance.

23. QUARTZ

Quartz is a mineral composed of silicon and oxygen, with a chemical composition of SiO_2

It is the most abundant mineral in Earth's crust and is resistant to both chemical and physical weathering. When rocks weather away, the residual material usually contains quartz. This is why the sand at most of the world's beaches is quartz.

- **Usage:**

Quartz sand is used inside the production of field glass, flat plate glass, uniqueness glass, and fiberglass.

The high hardness of quartz, seven at the Mohs scale, makes it more difficult than most different natural materials. As such it's miles an wonderful abrasive cloth. Quartz sands and finely floor silica sand are used for sand blasting, scouring cleansers, grinding media, and grit for sanding and sawing.

It may be very proof against both chemical compounds and heat. It is therefore frequently used as a foundry sand. With a melting temperature better than maximum metals, it is able to be used for the molds and cores of commonplace foundry work. Refractory bricks are often made of quartz sand because of its excessive warmth resistance. Quartz sand is likewise used as a flux in the smelting of metals.

Quartz sand has a excessive resistance to being beaten. In the petroleum industry, sand slurries are compelled down oil and gasoline wells below very excessive pressures in a technique referred to as hydraulic fracturing.

Quartz sand is used as a filler inside the manufacture of rubber, paint, and putty. Screened and washed, carefully sized grains are used as filter media and roofing granules. Quartz sands are used for traction within the railroad and mining industries. These sands also are used in recreation on golfing publications, volleyball courts, baseball fields, kid's sand boxes and seashores.

It makes an terrific gemstone. It is hard, durable, and usually accepts a super polish. Popular sorts of quartz that are widely used as gem stones include: amethyst, citrine, rose quartz, and aventurine. Agate and jasper are also kinds of quartz with a microcrystalline structure.

"Silica stone" is an industrial term for materials consisting of quartzite, novaculite, and different microcrystalline include rocks. These are used to provide abrasive gear, deburring media, grinding stones, hones, oilstones, stone files, tube-mill liners, and whetstones.

Tripoli is crystalline silica of an exceedingly high-quality grain length (less than ten micrometers). Commercial tripoli is a almost pure silica cloth this is used for a diffusion of mild abrasive purposes which encompass: soaps, toothpastes, metallic-sprucing compounds, rings-sharpening compounds, and buffing compounds. It can be used as a polish while making tumbled stones in a rock tumbler. Tripoli is likewise used in brake friction merchandise, fillers in teeth, caulking compounds, plastic, paint, rubber, and refractories.

24. LIME

Lime is the versatile mineral. Various forms of lime are used in environmental, metallurgical, construction, and chemical/industrial applications, and more. The fastest growing use of lime is in environmental applications, where lime is used to comply with air, drinking water, waste water, and solid waste regulations.

- **Usage:**

Lime is the versatile mineral. Various forms of lime are used in environmental, metallurgical, construction, and chemical/industrial applications, and more. The fastest growing use of lime is in environmental applications, where lime is used to comply with air, drinking water, wastewater, and solid waste regulations.

However, the largest single use of lime remains steel manufacturing, where it is used to remove impurities. In construction, the dominant use of lime is in soil stabilization for roads, earthen dams, airfields, and building foundations. Lime can be combined with certain additives to produce other metals and is also a key ingredient in mortar and plaster in lime slurry form. As an additive in asphalt, lime improves its cohesion, reduces stripping, and retards the aging process. A growing use for lime is the production of precipitated calcium carbonate, which is used in the production of paper, paint, ink, plastic, rubber,

and some foods. The paper industry uses lime as a causticizing agent, for bleaching, and to produce PCC for their own use.

These and other key uses of lime, such as for sugar refining, refractories, and other food industries are discussed in this area.

25. BAUXITE

Bauxite is a sedimentary rock mineral that is the primary source of aluminum. It is formed through the weathering of aluminum-rich rocks in tropical and subtropical regions.

Bauxite contains a mixture of minerals, including gibbsite, boehmite, and diaspore, as well as iron oxides and kaolinite. The exact mineral composition of bauxite can vary depending on the location and geological processes that formed it. However, the primary mineral in bauxite is gibbsite, which typically makes up around 60% of its composition.

- **Usage:**

Bauxite is primarily used to produce alumina (aluminum oxide), which is then used to produce aluminum metal. However, bauxite has other industrial uses as well. Here are some of the main uses of bauxite:

Aluminum production: The most significant use of bauxite is as a raw material for producing alumina, which is then used to produce aluminum metal. Aluminum is a lightweight, strong, and corrosion-resistant metal that is used in a wide range of applications, including construction, transportation, packaging, and electronics.

Refractories: Bauxite is also used in the production of refractory materials, which are used to line high-temperature furnaces and kilns. Refractory materials must be able to withstand extremely high temperatures and resist corrosion, making bauxite an ideal material for this application.

Abrasives: Bauxite can be used as an abrasive material for sandblasting and grinding. When bauxite is crushed and processed, it can produce aluminum

oxide, which is a common abrasive material used in sandpaper, grinding wheels, and cutting tools.

Cement: Bauxite can be used as a raw material in the production of cement. When bauxite is processed with limestone and heated in a kiln, it produces a type of cement known as calcium aluminate cement.

Chemicals: Bauxite can be used to produce a variety of chemical products, including aluminum sulfate, which is used in water treatment, paper production, and other industrial applications.

Other uses: Bauxite can also be used as a filler material in plastics, as a component in drilling fluids, and as a source of iron and other metals. It is also used in some cosmetics and skincare products as a natural exfoliant.

26. MICA

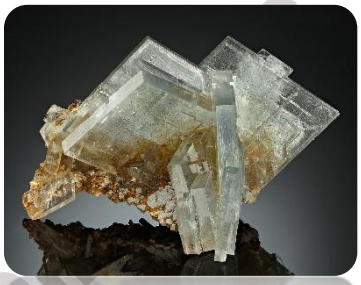
Mica, any of a group of hydrous potassium, aluminum silicate minerals. It is a type of phyllosilicate, exhibiting a two-dimensional sheet or layer structure. Among the principal rock-forming minerals, micas are found in all three major rock varieties—igneous, sedimentary, and metamorphic.

- **Usage:**

Their perfect cleavage, flexibility and elasticity, infusibility, low thermal and electrical conductivity, and high dielectric power, muscovite and phlogopite have found great success. Most "sheet mica" with those compositions have been used as electrical condensers, as insulation sheets between commutator segments, or in heating factors. Sheets of muscovite of particular thicknesses are applied in optical instruments. Ground mica is used in many approaches which includes a dusting medium to prevent, for example, asphalt tiles from sticking to each other and also as a filler, absorbent, and lubricant. It is likewise used inside the manufacture of wallpaper to provide it a glittery luster. Lepidolite has been mined as an ore of lithium, with rubidium generally recovered as a by-product. It is used inside the manufacture of heat-resistant glass. Glauconite-rich greensands have found use inside the United States as fertilizer—e.g., on the coastal undeniable of New Jersey—and a few glauconite

has been employed as a water softener because it has an excessive base-change capability and has a tendency to regenerate.It is also used in transistors and high-pressure steam boilers.

27. BARITE



Barite, also called barites or heavy spar with high specific gravity of 4.5, the most common barium mineral, barium sulfate (BaSO4). Barite occurs in hydrothermal ore veins (particularly those containing lead and silver), in sedimentary rocks such as limestone, in clay deposits formed by the weathering of limestone, in marine deposits, and in cavities in igneous rock. Commercially, ground barite has been used in oil well and gas well drilling muds; in the preparation of barium compounds; as a body, or filler, for paper, cloth, and phonograph records; as a white pigment (see lithopone); and as an inert body in colored paints. By the early 21st century, China and India had become the world's top producers of barite, and significant amounts were also being mined by the United States, Morocco, and Iran.

- **Usage:**

Barite is the main ore of the element barium. It is also important in the manufacture of paper and rubber. Barite is also used in radiology for x-rays of the digestive system. Barite is used to make high-density concrete to block x-ray emissions in hospitals, power plants, and laboratories. When crushed, it is added to mud to form barium mud, which is poured into oil wells during drilling. Barite is also used as a pigment in paints and as a weighted filler for paper, cloth and rubber.

Barite is also a very popular and common mineral among collectors

28. ASBESTOS

Asbestos is a group of six naturally occurring minerals made up of thin, microscopic fibers. Asbestos is heat and chemical resistant, fireproof and strong.

This made asbestos a popular additive in thousands of products. Mineralogically, asbestos includes certain silicate minerals that have a highly fibrous (asbestiform) structure, are heat resistant and chemically inert, possess high electrical insulating qualities, and are of sufficient flexibility to be woven.

- **Usage:**

Asbestos was used for its ability to strengthen and fireproof materials, including concrete, bricks, fireplace cement, pipes and insulation.

Common asbestos products include: Asbestos adhesives, Asbestos cement (transite), Asbestos felt, Asbestos sheets, Asbestos textiles, Asbestos tiles, Construction materials, Ductwork connectors, Gaskets Insulation, Popcorn ceiling products, Talcum powder, Transportation and automotive products, Vinyl, Zonolite insulation

29. PEARLITE

Derived from volcanic rock, perlite is a natural, lightweight, inert and fireproof rock making it a rock of choice for a wide variety of end uses from cosmetics to construction.

Physical properties

- **Lightweight**
- **Excellent thermal and acoustic insulating properties**
- **Elasticity**
- **Fire resistance**
- **Thermal stability**

- **Usage:**

Uses for perlite

Yes, most of us are familiar with perlite because of its uses in gardening, but it actually plays important roles in other industries because of its lightweight nature and other advantageous properties.

Gardening: Perlite can be added to soilless mixes to improve drainage and aeration, providing more oxygen to plant roots. It is also added to gardens as a soil additive to improve soil structure. Perlite also helps reduce soil compaction in clay soils. It is used as a standalone product to germinate seeds, root cuttings, and anchor/support root systems in hydroponic gardening setups.

Construction: Perlite is used as loose fill material in hollow concrete blocks or masonry walls for insulation.

Filtration: Perlite is increasingly being used to filter solids out of liquids in many applications.

Manufacturing: Perlite is also used as an ingredient in lightweight concrete and plasters, ceiling tiles, and acoustical sprays to name a few.

30. GRANITE

Granite is a coarse-grained (phaneritic) intrusive igneous rock composed mostly of quartz, alkali feldspar, and plagioclase.

It forms from magma with a high content of silica and alkali metal oxides that slowly cools and solidifies underground. It is common in the continental crust of Earth, where it is found in igneous intrusions.

- **Usage:**

People have used granite for thousands of years. It is used as a construction material, a dimension stone, an architectural stone, a decorative stone, and it has also been used to manufacture a wide variety of products.

Granite is used in buildings, bridges, paving, monuments, and many other exterior projects. Indoors, polished granite slabs and tiles are used in countertops, tile floors, stair treads and many other design elements. Granite is a prestige material, used in projects to produce impressions of elegance and quality. Granite used in Fireplace Mantle and Floor. They are used in jewellery.

31. IRON ORE

Iron ore is a mineral substance which, when heated in the presence of a reductant, will yield metallic iron (Fe). It almost always consists of iron oxides, the primary forms of which are magnetite (Fe_3O_4) and hematite (Fe_2O_3). Iron ore is the source of primary iron for the world's iron and steel industries. It is therefore essential for the production of steel, which in turn is essential to maintain a strong industrial base.

Almost all (98%) iron ore is used in steelmaking. Iron ore is mined in about 50 countries. The seven largest of these producing countries account for about three-quarters of total world production. Australia and Brazil together dominate the world's iron ore exports, each having about one-third of total exports.

Iron ore is a mineral that has been used for centuries to create various metal products. It can be used in its raw form or smelted into metal to be used in construction, manufacturing, and other industrial applications. Its most common uses are for making steel and iron products such as nails, tools, and pipes. Iron ore also plays a vital role in creating machine parts for the automotive, aerospace, and other industries. In addition to these industrial uses, it is also an important component in animal feed and fertiliser production. Moreover, its use as a colouring agent has made it popular among potters, painters, and other artists. Iron ore is also becoming increasingly used in various types of energy production, including in the form of pellets or briquettes. Its popularity is due to its affordability and availability, making it a great choice for various uses. All in all, iron ore has a wide range of applications and continues to be an important resource for both businesses and consumers.