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GEOLOGICAL FORMATION DOLOMITE, OCCURRENCE AND APPLICATION IN GEMSTONES

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ABSTRACT
Calcite and aragonite, dolomite makes up approximately 2 percent of the Earth'ss crust. The bulk of the dolomite constitute dolostone formations that occur as thick units of great areal extent in many sequences of chiefly marine strata. (The rock dolostone is referred to by only the mineral name—i.e., dolomite—by many geologists.) The Dolomite Alps of northern Italy are a well-known example. Other relatively common occurrences of the mineral dolomite are in dolomite marble and dolomite-rich veins. It also occurs in the rare igneous rock known as dolomite carbonatite. Dolomite is a colorless, tan, or pink mineral known for its unusual saddle-shaped crystal clusters. Is dolomite a gemstoneAbsolutely! Although, it's more popular as a collector's gem.

INTRODUCTION

Description:
Carbonate (CaMg(CO3)2). It is named after the French mineralogist Déodat Gratet de Dolomieu, who first described its properties in the late 18th century. Dolomite is often found in sedimentary rock formations and can occur in a variety of colors, ranging from white to gray, pink, green, or even brown.

Composition: Dolomite is chemically similar to limestone, as both are primarily composed of calcium carbonate (CaCO3). However, dolomite has an additional magnesium component (MgCO3), which makes it a double carbonate. This magnesium content distinguishes dolomite from limestone.
Formation: Dolomite forms in various geological settings, typically through a process called dolomitization. This process involves the alteration of limestone by magnesium-rich fluids. The magnesium ions replace some of the calcium ions in the mineral structure, leading to the formation of dolomite.
Crystal Structure: Dolomite crystallizes in the trigonal crystal system. Its crystal structure is similar to that of calcite (a common form of calcium carbonate), but it has alternating layers of calcium and magnesium ions.
Physical Properties: Dolomite is often recognized by its distinctive pinkish or gray color and its relatively high hardness on the Mohs scale, usually ranging from 3.5 to 4. It also often exhibits a pearly to vitreous luster.
Uses: Dolomite has various practical applications in industry and construction. It is used as a source of magnesium and calcium in the production of metals and alloys. It is also crushed and used as a construction material, particularly as a base material for roads, as an aggregate in concrete, and as a filler in various products like paints, plastics, and ceramics.
Geological Importance: Dolomite-bearing rocks can be important indicators for understanding the geological history of an area. Their presence can provide insights into past environmental conditions, such as the composition of ancient seas and the processes that led to their formation.
Health Considerations: While naturally occurring dolomite is generally safe, certain products containing finely ground dolomite, such as dietary supplements and antacids, have raised concerns about potential health risks due to the presence of trace amounts of heavy metals like lead. It's important to use such products cautiously and follow health guidelines.

Geological Formation and Occurrence

Dolomite Mineral and a Rock
Dolomite forms through a geological process known as dolomitization, which involves the alterationof pre-existinglimestine or lime-richsedime ntary rocks. This process occurs over millions of years and typically

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involves the interaction of fluids rich in magnesium with the calcium carbonate minerals in the rock. Here's a more detailed explanation of the geological formation and occurrence of dolomite:

1. **Source of Magnesium-Rich Fluids:** The process of dolomitization requires a source of magnesium-rich fluids. These fluids can come from a variety of sources, including seawater, groundwater, or hydrothermal solutions. As these magnesium-rich fluids circulate through the rock, they interact with the calcium carbonate minerals.
2. **Replacement of Calcium with Magnesium:** In dolomitization, magnesium ions (Mg^{2+}) replace some of the calcium ions (Ca^{2+}) within the calcium carbonate mineral structure. This substitution alters the mineral composition from pure calcium carbonate (calcite) to a combination of calcium magnesium carbonate (dolomite). The process of ion substitution takes place over long periods of time.
3. **Crystal Structure Changes:** The replacement of calcium with magnesium affects the crystal structure of the rock. Dolomite crystals have a distinct rhombohedral shape and consist of layers of alternating calcium and magnesium ions. This crystal structure is different from the simple hexagonal structure of calcite.
4. **Sedimentary Environments:** Dolomite can form in a variety of sedimentary environments, including marine, lacustrine (lake), and evaporitic settings. In marine environments, for example, magnesium-rich seawater interacts with limestone sediments, leading to dolomitization. Evaporitic settings, where water evaporation concentrates minerals, can also facilitate dolomite formation.
5. **Dolomite Rock Types:** The result of dolomitization is the formation of dolomite-rich rocks. These rocks can include dolostone, which is the equivalent of limestone but composed primarily of dolomite. Dolostones can vary in texture from fine-grained to coarse-grained, and their color can range from pale gray to various shades of pink, green, or brown.
6. **Geological History:** The occurrence of dolomite-bearing rocks can provide valuable insights into the geological history of an area. For example, the presence of dolomite can indicate past changes in sea chemistry, such as shifts in magnesium and calcium concentrations. These rocks can also reflect the processes that occurred during diagenesis, which is the transformation of sediments into solid rock.

Dolomite Gemstone

Dolomite is a colorless, tan, or pink mineral known for its unusual saddle-shaped crystal clusters. Is dolomite a gemstoneAbsolutely! Although, it's more popular as a collector's gem.

You should know "dolomite" refers to both the dolomite mineral and the dolomite rock. The rock is also called dolostone, but some still call it "dolomite." Don't worry — we'll only call the mineral "dolomite" and the rock "dolostone."

What makes dolomite unique? We'll answer that today as we dig into dolomite gemstone properties, varieties, uses, and more!

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About Dolomite Stone

Dolomite is a popular minerals specimen that shares its name with Italy's Dolomite Alps. Besides dolostone, dolomite is also an essential part of other gemstones such as Tiffany stone and synthetic opalite.

dolomite inclusions in preciousgemstones like emeralds andrubies, or more commonly quartz. Dolomite beads are even used to cultvate pearls

Beyond gems, dolomite uses stretch across various industries.

Here's what dolomite is used for:

- Stabilizing glass
- Providing magnesia
- Researching particles
- Restoring streams

Astrologically, dolomite is azodiac stone for Aries. Dyed dolomite resemblesturquoise and can substitute for this traditional December birth stone.

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Dolomite Specifications & Characteristics

The dolomite mineral is a calcium magnesium carbonate with the formula CaMg(CO3)2. Common additional elements are manganese, zirconium, iron, lead, and cobalt.

The rock dolostone is a sedimentary carbonate rock composed of over 50 percent dolomite. Dolomites are found as crystals, crystal clusters, or masses, which are more durable.

Here are all the dolomite crystal properties:

- **Mohs hardness**: 3.5-4 - Varies by crystal direction
- **Color**: Colorless, white, gray, pink, or tan, very rarely light blue (dolomite); Tan, brown, white, or gray (ankerite); Pink, white, or tan (kutnohorite)
- **Crystal structure**: Trigonal
- **Luster**: Vitreous to pearly (dolomite & ankerite); Subvitreous, resinous, or dull (kutnohorite)
- **Transparency**: Transparent to translucent (crystals); Translucent to opaque (masses)
- **Refractive index**: 1.50-1.68 (dolomite); 1.51-1.75 (ankerite); 1.52-1.73 (kutnohorite)
- **Density**: 2.84-2.93 (dolomite); 2.93-3.10 (ankerite); 3.10-3.12 (kutnohorite)
- **Cleavage**: Perfect 3-direction (dolomite); Perfect 1-direction on [1011] (ankerite & kutnohorite)
- **Fracture**: Conchoidal (dolomite); Subconchoidal (ankerite & kutnohorite)
- **Streak**: White
- **Luminescence**: Sometimes triboluminescence (friction-induced glow); Sometimes fluorescence - Manganoan dolomite - light pink to bright red in SW-UV and LW-UV; Dolomite - White, blue, light green, or orange in LW-UV & white, blue, light green, or tan in SW-UV

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Types of Dolomite

Dolomite has seven varieties we'll discuss. Four of them aren't varieties so much as variants, meaning they're only slightly different, not distinct enough to warrant a separate variety:

- **Cuprian Dolomite**: Light green variant containing cuprite
- **Cobaltoan Dolomite**: Rare, bright pink to fuchsia variant containing cobalt
- **Manganoan Dolomite**: Pink variant containing manganese

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- **Ferroan Dolomite**: Pinkish-red to brown variant containing ferrous iron (Fe2+), but less iron than magnesium

- Beautful Rock of Dolomite

The next "varieties" are in the dolomite series. Generally, that means they share the same crystal structure but an element in their formulas is changed:

- **Ankerite**: Typically tan to brown (can be white or gray), translucent to transparent type containing iron and manganese, with more iron than magnesium
- **Kutnohorite**: Rare, manganese-rich, commonly pink (can be white or tan) and translucent type
- **Minrecordite**: Very rare, translucent white or colorless type containing zinc and calcium

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Pictured above: Wave dolomite

Dolostone Varieties

Dolostone is also used as a gemstone, so it's worth knowing the dolostone varieties:

- **Caymanite**: White, red, or black Cayman Islands variety sometimes color-banded in orange, brown, and gray
- **Kona Dolomite**: Ancient pink to red variety containing teal-colored fossilized algae (stromatolites), often patterned in yellow, orange, brown, gray, and white
- **Wave Dolomite**: Also called Rolling Hills dolomite, a type of Kona dolomite with waved banding in orange, tan, and red shades

Caymanite is harder than any varieties mentioned (including dolostone) at 5-7 on the mohs scale.

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Dolomite Gemstone Meaning & History

Dolomite symbolizes comfort, centeredness, and emotional nourishment. It carries Dolomite Alps folklore, specifically legends of the local Ladins. The most significant Ladinian tale is the national epic about the matriarchal "Kingdom of the Fanes."

In a nutshell, the legend tells of the first Ladins, a matrilineal society of people called the Fanes. They thrived for generations under the queen's rule.

Their downfall came when the new king started waging war for greed and betrayed his people for access to *Aurona*, a "land of plenty."

The king became stone and the remaining Fanes retreated inside the mountains. It's said their kingdom will be reborn once silver trumpets sound.

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History

The name of the dolomite mineral, rock, and mountain range all honor French mineralogist Déodat de Dolomieu.

Dolomieu described dolomite rock (dolostone) in 1791 after finding it in the Alps of Tyrol (present-day Dolomite Alps). Swiss chemist Nicolas-Théodore de Saussure chose the name in 1792.

However, Saussure also confirmed Dolomieu was *not* the first to describe dolomite. Rather, the first description came from Swedish botanist Carl Linnaeus in 1768, who called it *marmor tardum*, or "slow

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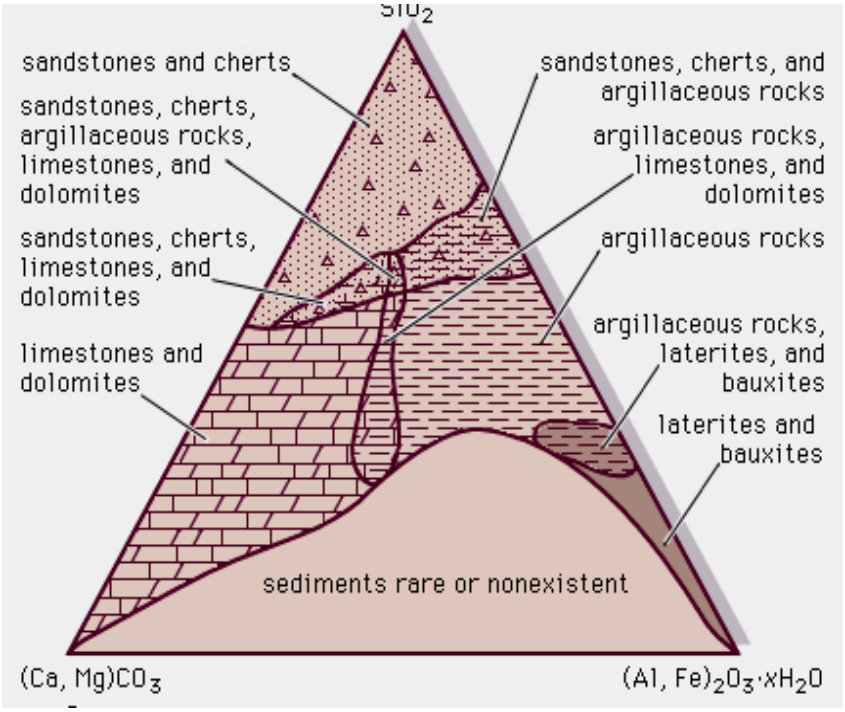

marble."

Yet another description came in 1778 from Austrian naturalist Belsazar Hacquet, who called the stone *lapis suillus*, or "stink stone."

Fortunately, there wasn't any animosity among the men. When Dolomieu met with Hacquet in Slovenia in 1784, Hacquet made it clear that Linnaeus's description came before his own. Hacquet even specified this in volume 2 of his book published in 1781.

In the 20th century, geologists proposed "dolostone" as an alternative name for dolomite rock to differentiate it from the mineral. Because "dolomite" first applied to the rock, however, many geologists didn't agree on the change. In fact, the American Geological Institute called the dolostone name "obsolete" in their 2017 glossary.

Moving from history to healing, what is dolomite stone good for?

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Dolomite Crystal Healing Properties

Both dolomite and dolostone can function as powerful healing stones with similar abilities.

Pink dolomite healing properties match those of otherpinkgem stones in promoting love, acceptance, and forgiveness. Unsurprisingly, they're also great chakra stones for the heart chakra!

Similarly, like otherwhite crtstals, white dolomites can improve concentration, increase spirituality, and detoxify the body.

For more specific physical and emotional ailments, how do you use dolomite stone?

Physical Healing

Crystal healers use dolomite for:

- Strengthening bones
- Increasing blood oxygenation
- Easing premenstrual syndrome
- Improving stamina

Emotional Healing

Emotional dolomite stone benefits are said to include dispelling negative thoughts, balancing chaotic emotions, and encouraging spiritual connection.

Cobaltoan dolomite is also popular for navigating deep emotional wounds, helping you handle the discomfort of working through them, then find your own strength to go forward.

Beyond spiritual uses, is dolomite valuable? You bet! We'll cover its value factors next.

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Dolomite Gemstone Properties

Because dolomite is less common for jewelry, grading its value isn't as standard as other gems. However, the categories are similar: color, cut, transparency, carat weight, and treatments.

Color

Dolomite color in crystal form is usually a pale shade of gray, white, yellowish-brown, pink, or blue. Masses tend to be white, gray, or tan.

Color patterns in dolostone result from their layered structure of different minerals and impurities. Over time, ferrous iron and weathering cause most dolostones to become matte yellowish-brown.

Cut

Perfect cleavage and variable softness makes cutting dolomite difficult. Still, some skilled gem cutters create beautiful faceteddolomites.

Typically, dolomite crystals are sold in their raw form. Pink kutnohorite clusters can form fascinating tapered shapes resembling rounded feather dusters. Ankerite and massive dolomite are occasionally faceted or cut as cabochonsDolomite masses and dolostones are more durable, perfect for carvings, beads, and cabochons. These are slightly more valuable than dolomite crystals.

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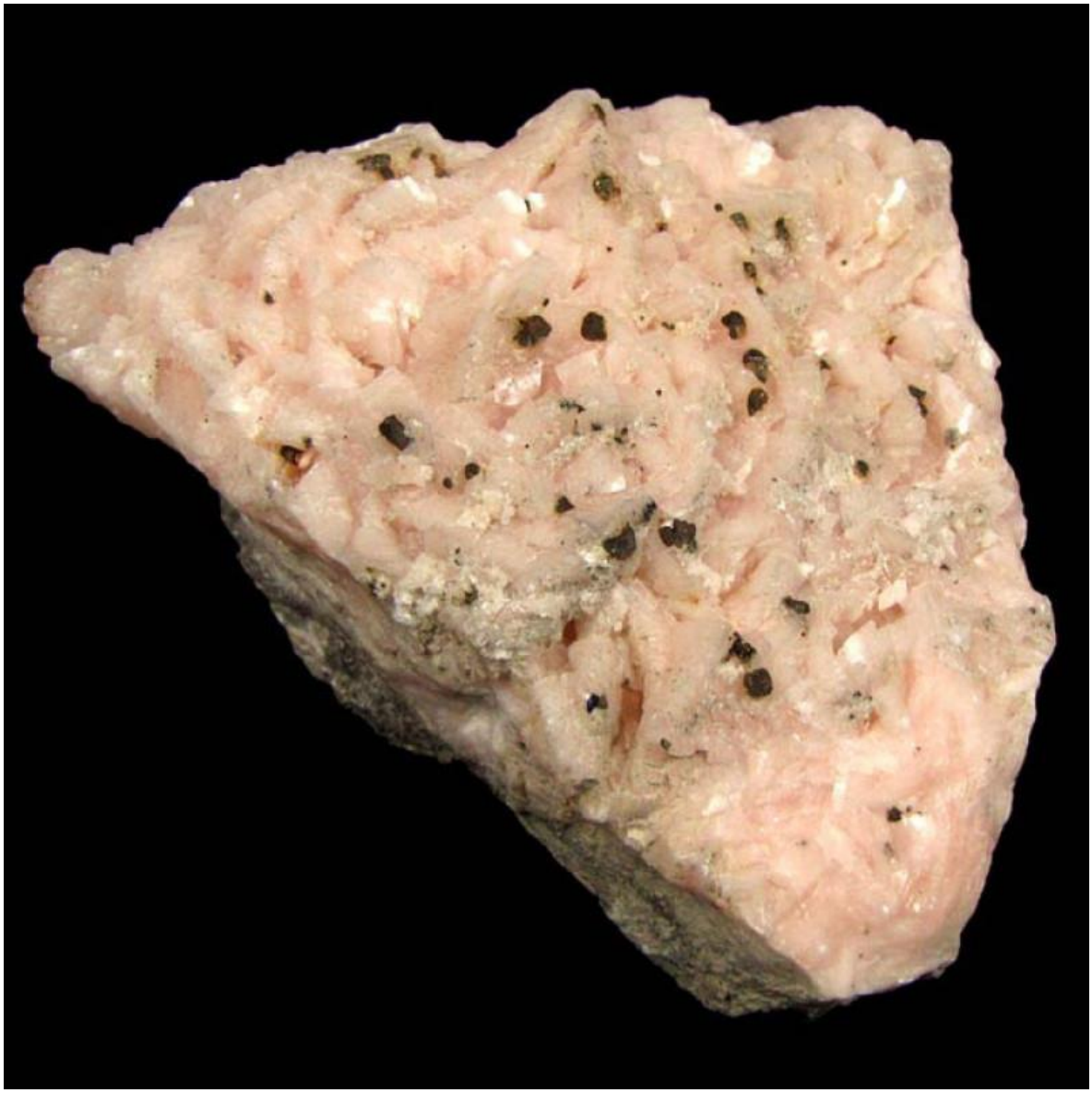

Dolomite Formation & Sources

Varied theories surround dolomite's formation, but the most-discussed process is dolomitization.

Dolomitization starts with calcite, another calcium carbonate. When seawater or saltwater evaporates, commonly in coastal salt flats, magnesium separates. This magnesium replaces calcite's calcium, transforming it into dolomite.

Miners find most dolomites in metamorphic rocks, geodes, dolomitic marble, and talc rocks.

Where can dolomite be found?

Mining Locations

Dolomites are abundant worldwide. Spain is renowned for high-quality, transparent crystals and clusters. Colombia is the only known source of light blue dolomites.

More primary sources include:

- Brazil
- Canada
- China
- Czechia (cobaltoan, kutnohorite)

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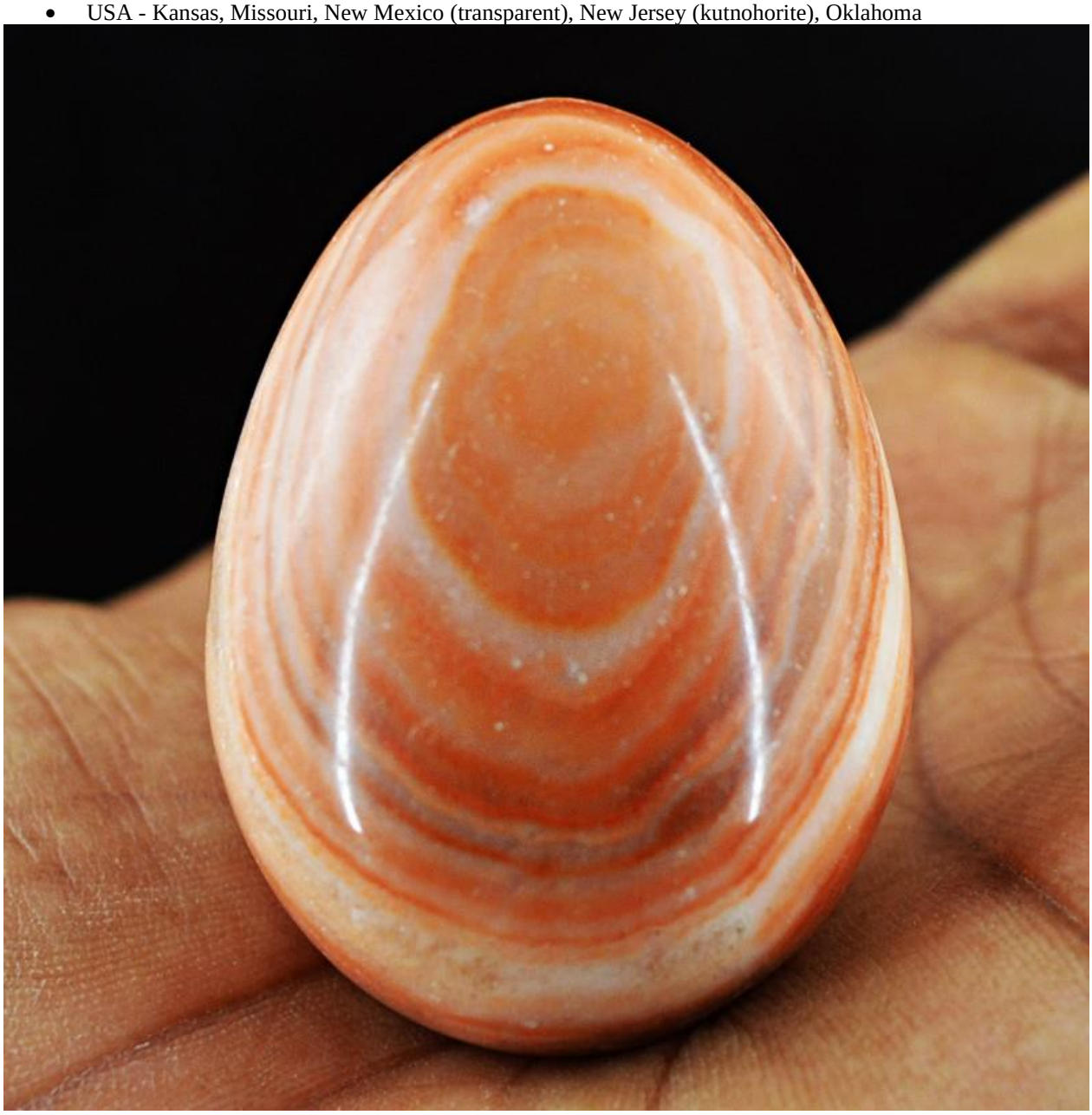
- DR of Congo (cobaltoan)
- Italy (kutnohorite)
- Japan (kutnohorite)
- Mexico (wave dolomite)
- Morocco (cobaltoan)
- Namibia (cobaltoan, cuprian)
- South Africa (kutnohorite)
- Switzerland
- Tasmania (ankerite)
- USA - Kansas, Missouri, New Mexico (transparent), New Jersey (kutnohorite), Oklahoma



Dolomite Price & Value

Dolostones are slightly more expensive than dolomites because they're more durable.

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Wave dolostone cabochons, often labeled “dolomite jasper,” range from $0.10-$2.50 per carat. Carvings are $0.02-$0.40 per carat.

How much is dolomite worth? Dolomite cabochons are around $0.04 per carat at wholesale. Rough dolomite or ankerite specimens cost $0.02-$0.30 per carat.

Dolomite pendants or rings cost $3-$4, though added materials can mean prices around $30-$70. Faceted dolomite gemstones go for $20-$30 per carat.

Dolomite Care and Maintenance

The first gemstonecare step is choosing a low-vulnerability option. Because dolomite is prone to damage, pendants or earrings are safest. We recommendprotective for rings.

Store dolomite in a fabric pouch separate from other gems. To clean it, simply mix warm water and mild soap, dip a soft brush in the mixture, and gently scrub the stone. Dry it with a microfiber cloth after. Avoid strong chemicals or high heat.

Delight in the Landscape of Dolomite!

Both dolomite and dolostone are beautiful gifts of nature. Wearing or carrying dolomite brings the pleasures and centeredness of being in the Dolomite Alps… without the airfare!

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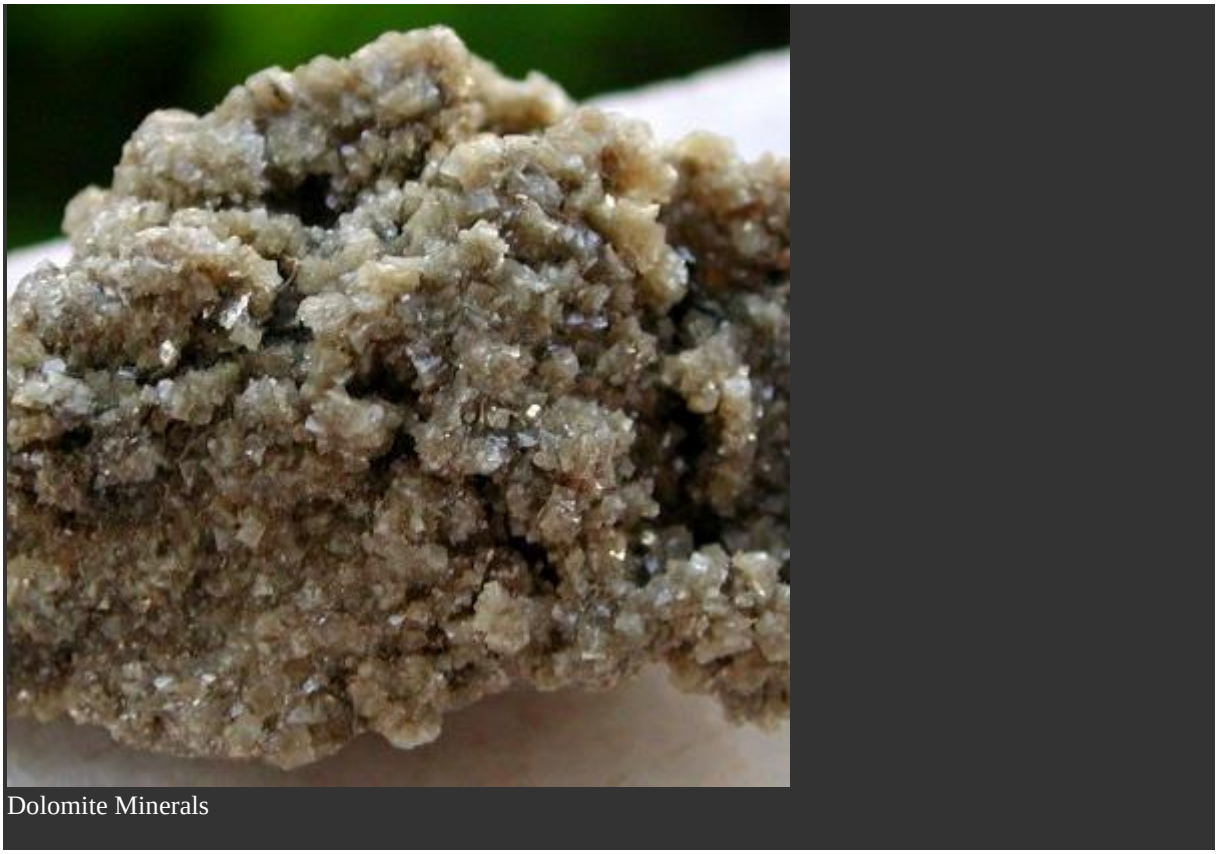

Dolomite Lumps, Packaging Type Loose

Physical Properties of Dolomite

Dolomite is a mineral with distinctive physical properties that stem from its crystal structure and chemical composition. Here are the key physical properties of dolomite:

1. **Color:** Dolomite can exhibit a wide range of colors, including white, gray, pink, green, and brown. The specific color depends on the presence of impurities and trace elements in the mineral. Different colors are often due to variations in the mineral's crystal lattice caused by these impurities.
2. **Luster:** Dolomite typically displays a vitreous (glassy) to pearly luster on its cleavage surfaces. The luster results from the way light interacts with the mineral's smooth surfaces, giving it a characteristic sheen.
3. **Transparency:** Dolomite is usually translucent to opaque. Light can pass through thin sections of the mineral, but thicker pieces tend to be opaque.
4. **Crystal System:** Dolomite crystallizes in the trigonal crystal system, forming rhombohedral crystals. This crystal system gives dolomite its distinct crystal shapes and symmetry.
5. **Crystal Habit:** Dolomite crystals often form rhombohedral (diamond-shaped) crystals with flat faces and angles that resemble equilateral triangles. These crystals can also occur in aggregates or granular masses.
6. **Cleavage:** Dolomite exhibits three perfect cleavage directions that intersect at angles close to 60 and 120 degrees. Cleavage planes are often seen as flat surfaces on dolomite crystals.
7. **Hardness:** Dolomite has a Mohs hardness of around 3.5 to 4, which means it is relatively soft compared to minerals like quartz. It can be scratched with a knife blade or acopper penny.
8. **Density:** The density of dolomite varies depending on its composition and impurities but generally falls within the range of 2.8 to 2.9 grams per cubic centimeter.

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9. **Specific Gravity:** Dolomite's specific gravity, a measure of its density compared to the density of water, typically ranges from 2.85 to 2.95.
10. **Fracture:** Dolomite has a conchoidal to uneven fracture, meaning it breaks with curved or irregular surfaces. The nature of the fracture can vary based on the specific conditions of the mineral sample.
11. **Effervescence:** One of the characteristic tests for dolomite is its reaction with weak acids, such as hydrochloric acid. When dolomite is exposed to these acids, it produces carbon dioxide gas, resulting in effervescence. This reaction distinguishes dolomite from minerals like calcite.
12. **Streak:** The streak of dolomite, which is the color of the mineral's powdered form, is often white. However, it can vary depending on impurities present in the sample.

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Importance and Uses

Dolomite has several important uses across various industries due to its unique chemical and physical properties. Here are some of the key applications and significance of dolomite:

1. **Construction and Building Materials:** Dolomite is commonly used as a construction and building material. Crushed dolomite is often used as a base material for roads, driveways, and pathways. It provides a stable foundation and helps to prevent erosion and settling. Dolomite aggregates are also used in concrete and asphalt production to enhance the strength and durability of these materials.
2. **Magnesium Production:** Dolomite is a significant source of magnesium, an essential element used in a wide range of applications. It serves as a raw material in the production of magnesium metal and alloys. Dolomite can be calcined (heated at high temperatures) to extract magnesium oxide (MgO), which can then be used in various industrial processes.
3. **Agricultural Applications:** Dolomite is used as a soil conditioner in agriculture to improve the pH balance of acidic soils. It contains both calcium and magnesium, which are beneficial for plant growth. Dolomite can help neutralize soil acidity, promote nutrient absorption, and enhance overall soil fertility.
4. **Fertilizer Additive:** Dolomite is sometimes used as an additive in fertilizers to provide a source of calcium and magnesium. These nutrients are important for plant health and growth. Dolomite-based fertilizers are particularly useful for crops that require higher levels of magnesium, such as tomatoes and peppers.
5. **Refractory Materials:** Dolomite's high melting point and resistance to heat and fire make it suitable for use in refractory materials. These materials are used in industrial furnaces, kilns, and other high-temperature applications where heat resistance is crucial.
6. **Ceramics and Glass Production:** Dolomite is used in the production of ceramics and glass as a source of magnesium and calcium. It can improve the properties of ceramic glazes and increase the durability of glass products.
7. **Water Treatment:** Dolomite is sometimes used in water treatment processes to help remove impurities from drinking water and wastewater. It can aid in the removal of heavy metals and provide alkalinity to neutralize acidic water.
8. **Metal Smelting:** Dolomite can be used as a fluxing agent in metal smelting processes. It helps to lower the melting point of the materials being processed, which can improve the efficiency of metal extraction.
9. **Dimension Stone:** Certain varieties of dolomite with attractive colors and patterns are used as ornamental and decorative stones in architecture and landscaping. These stones are often polished and used for countertops, flooring, and other interior and exterior design elements.
10. **Geological and Paleontological Studies:** Dolomite-bearing rocks play a role in understanding the Earth's geological history and can provide valuable insights into past environmental conditions and changes.Fossils and sedimentary structures within dolomitic rocks offer clues about ancient ecosystems and past marine environments.

Conclusion: Three types of dolomite rock can be distinguished. The most common type of dolomite rock is a former limestonethat was dolomitized. These dolomite rocks are often referred to as secondary dolomites, especially in the older literature. Dolomitization means that calcium carbonate (minerals aragonite or calcite —

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the main constituent of limestone) were replaced by calcium magnesium carbonate (mineral dolomite) through the action of magnesium-bearing water percolating the limestone or limy mud. Dolomite may precipitate out of aqueous solutions (sandstones with a dolomitic cement) and some dolomitic rocks are so-called primary dolomites. These were formed in lagoons where dolomite directly precipitates out of saline seawater, but such dolomites are much rarer than previously thought. Primary dolomite deposition is known only from few cases of Holocene (last 12,000 years) age. It is possible that primary dolomites were somewhat more widespread in the past, but this hypothesis is difficult to prove or reject because of later diagenetic (processes affecting sediment after deposition) overprinting of original material. However, it seems very hard to believe that primary dolomite deposition was once the dominant way how dolomitic rocks were formed because laboratory experiments have shown that dolomite does not precipitate from aqueous solutions at the atmospheric conditions (pressure 1 atm, temperature below 60 °C)[4].

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