

Gypsum

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This article is about the mineral. For other uses, see [Gypsum \(disambiguation\)](#).

Gypsum



Fibrous gypsum selenite showing its [translucent](#) property

General

Category [Sulfate minerals](#)

[Formula](#) CaSO₄·2H₂O
(repeating unit)

[Strunz classification](#) 07.CD.40

[Crystal system](#) Monoclinic 2/m – Prismatic

[Unit cell](#) a = 5.679(5) Å, b = 15.202(14) Å, c = 6.522(6) Å; β = 118.43°; Z=4

Identification

Color Colorless to white; may be yellow, tan, blue, pink, brown, reddish brown or gray due to impurities

[Crystal habit](#) Massive, flat. Elongated and generally prismatic crystals

[Crystal symmetry](#) Monoclinic 2/m

<u>Twinning</u>	Very common on {110}
<u>Cleavage</u>	Perfect on {010}, distinct on {100}
<u>Fracture</u>	Conchoidal on {100}, splintery parallel to [001]
Tenacity	Flexible, inelastic.
<u>Mohs scale hardness</u>	1.5–2 (defining mineral for 2)
<u>Luster</u>	Vitreous to silky, pearly, or waxy
<u>Streak</u>	White
<u>Diaphaneity</u>	Transparent to translucent
<u>Specific gravity</u>	2.31–2.33
Optical properties	Biaxial (+)
<u>Refractive index</u>	$n_{\alpha} = 1.519\text{--}1.521$ $n_{\beta} = 1.522\text{--}1.523$ $n_{\gamma} = 1.529\text{--}1.530$
<u>Birefringence</u>	$\delta = 0.010$
<u>Pleochroism</u>	None
<u>2V angle</u>	58°
<u>Fusibility</u>	5
<u>Solubility</u>	Hot, dilute HCl
References	[1] [2] [3]
Major varieties	
Satin spar	Pearly, fibrous masses
<u>Selenite</u>	Transparent and bladed crystals

Alabaster

Fine-grained, slightly colored

Gypsum is a soft [sulfate mineral](#) composed of [calcium sulfate dihydrate](#), with the [chemical formula](#) CaSO4⋅2H2O.^[3] It is widely mined and is used as a [fertilizer](#), and as the main constituent in many forms of [plaster](#), [blackboard](#) chalk and [wallboard](#). A massive fine-grained white or lightly tinted variety of gypsum, called [alabaster](#), has been used for [sculpture](#) by many cultures including [Ancient Egypt](#), [Mesopotamia](#), [Ancient Rome](#), [Byzantine empire](#) and the [Nottingham alabasters](#) of medieval England. It is the definition of a hardness of 2 on the [Mohs scale of mineral hardness](#). It forms as an [evaporite](#) mineral and as a hydration product of [anhydrite](#).

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Etymology and history[\[edit\]](#)

The word gypsum is derived from the [Greek](#) word γύψος (*gypsos*), "chalk" or "plaster".^[4] Because the [quarries](#) of the [Montmartre](#) district of [Paris](#) have long furnished burnt gypsum ([calcined](#) gypsum) used for various purposes, this dehydrated gypsum became known as [plaster of Paris](#). Upon addition of water, after a few tens of minutes plaster of Paris becomes regular gypsum (dihydrate) again, causing the material to harden or "set" in ways that are useful for casting and construction.

Gypsum was known in Old English as *spærstān*, "spear stone", referring to its crystalline projections. (Thus, the word [spar](#) in mineralogy is by way of comparison to gypsum, referring to any non-ore mineral or crystal that forms in spearlike projections). Gypsum may act as a source of sulfur for plant growth, which was discovered by [J. M. Mayer](#), and in the early 19th century, it was regarded as an almost miraculous fertilizer. American farmers were so anxious to acquire it that a lively smuggling trade with Nova Scotia evolved, resulting in the so-called ["Plaster War"](#) of 1820.^[5] In the 19th century, it was also known as **lime sulphate** or **sulphate of lime**.

Physical properties[\[edit\]](#)

Gypsum is moderately water-soluble (~2.0–2.5 g/l at 25 °C)^[6] and, in contrast to most other salts, it exhibits retrograde solubility, becoming less soluble at higher temperatures. When gypsum is heated in air it loses water and converts first to calcium sulfate hemihydrate, (bassanite, often simply called "plaster") and, if heated further, to anhydrous calcium sulfate (anhydrite). As for [anhydrite](#), its solubility in saline solutions and in [brines](#) is also strongly dependent on [NaCl](#) concentration.^[6]

Gypsum crystals are found to contain [anion water](#) and [hydrogen bonding](#).^[7]

Crystal varieties[\[edit\]](#)

Main article: [Selenite \(mineral\)](#)

Gypsum occurs in nature as flattened and often [twinned crystals](#), and transparent, cleavable masses called [selenite](#). Selenite contains no significant [selenium](#); rather, both substances were named for the ancient Greek word for the [Moon](#).

Selenite may also occur in a silky, fibrous form, in which case it is commonly called "satin spar". Finally, it may also be granular or quite compact. In hand-sized samples, it can be anywhere from transparent to opaque. A very fine-grained white or lightly tinted variety of gypsum, called [alabaster](#), is prized for ornamental work of various sorts. In

arid areas, gypsum can occur in a flower-like form, typically opaque, with embedded sand grains called [desert rose](#). It also forms some of the largest crystals found in nature, up to 12 metres (39 ft) long, in the form of selenite.^[8]

Occurrence^[edit]

Gypsum is a common mineral, with thick and extensive [evaporite](#) beds in association with [sedimentary rocks](#). Deposits are known to occur in [strata](#) from as far back as the [Archaean eon](#).^[9] Gypsum is deposited from lake and sea water, as well as in [hot springs](#), from [volcanic](#) vapors, and sulfate solutions in [veins](#). [Hydrothermal anhydrite](#) in veins is commonly hydrated to gypsum by groundwater in near-surface exposures. It is often associated with the minerals [halite](#) and [sulfur](#). Pure gypsum is white, but other substances found as impurities may give a wide range of colors to local deposits.

Because gypsum dissolves over time in water, gypsum is rarely found in the form of sand. However, the unique conditions of the [White Sands National Monument](#) in the US state of [New Mexico](#) have created a 710 km² (270 sq mi) expanse of white gypsum sand, enough to supply the construction industry with [drywall](#) for 1,000 years.^[10] Commercial exploitation of the area, strongly opposed by area residents, was permanently prevented in 1933 when president [Herbert Hoover](#) declared the gypsum dunes a protected [national monument](#).

Gypsum is also formed as a by-product of [sulfide oxidation](#), amongst others by [pyrite oxidation](#), when the [sulfuric acid](#) generated reacts with [calcium carbonate](#). Its presence indicates oxidizing conditions. Under reducing conditions, the sulfates it contains can be reduced back to sulfide by [sulfate reducing bacteria](#). Electric power stations burning coal with [flue gas desulfurization](#) produce large quantities of gypsum as a byproduct from the scrubbers.

Orbital pictures from the [Mars Reconnaissance Orbiter](#) (MRO) have indicated the existence of gypsum dunes in the northern polar region of Mars,^[11] which were later confirmed at ground level by the [Mars Exploration Rover](#) (MER) [Opportunity](#).^[12]