Gypsum – Calcium Sulfate

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Gypsum, Drywall, Plaster Paris

calcium sulfate dihydrate

used as a fertilizer

the main constituent in many forms of plaster, blackboard/sidewalk chalk, and drywall

Gypsum also crystallizes as translucent crystals of selenite

It forms as an evaporite mineral and as a hydration product of anhydrite.
gypsum became known as plaster of Paris

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 adding 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). In the mid-18th century, the German clergyman and agriculturalist Johann Friderich Mayer investigated and publicized gypsum's use as a fertilizer. Gypsum may act as a source of sulfur for plant growth, 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. In the 19th century, it was also known as **lime sulfate** or **sulfate of lime**.

When gypsum dehydrate severely, anhydrite is formed. If water is reintroduced, gypsum can and will reform – including as the four crystalline varieties, selenite, satin spar, desert rose and gypsum flower.

Gypsum is moderately water-soluble (~2.0–2.5 g/l at 25 °C) and, in contrast to most other salts, it exhibits retrograde solubility,

The structure of gypsum consists of layers of calcium (Ca^{2+}) and sulfate (SO4 2-) ions tightly bound together. These layers are bonded by sheets of anion water molecules via weaker hydrogen bonding, which gives the crystal perfect cleavage along the sheets (in the {010} plane).

Gypsum also precipitates onto brackish water membranes, a phenomenon known as mineral salt scaling, such as during brackish water desalination of water with high concentrations of calcium and sulfate. Scaling decreases membrane life and productivity. This is one of the main obstacles in brackish water membrane desalination processes, such as reverse osmosis or nanofiltration. Other forms of scaling, such as calcite scaling, depending on the water source, can also be important considerations in distillation, as well as in heat exchangers, where either the salt solubility or concentration can change rapidly.

A new study has suggested that the formation of gypsum starts as tiny crystals of a mineral called bassanite ($CaSO_4 \cdot 0.5H_2O$). This process occurs via a three-stage pathway:

1. homogeneous nucleation of nanocrystalline bassanite;
2. self-assembly of bassanite into aggregates, and
3. transformation of bassanite into gypsum.

Why would we ever add gypsum if we have soils saturated with calcium and sulfur or sulfate?
Why would we ever add gypsum and or acid to our soils from a water analysis alone?
There is NO scientific research that promotes this. The research that promotes gypsum addition is based on water quality, and cautions one to consider its impact on soil conditions.

Images of Gypsum

Crystals will create pore space but this is bound calcium sulfate, a cement, that **upon adding 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.** It competes with vegetation and other elements for water.