

# Synthetic Gypsum is still Gypsum

Don't be fooled by fancy chemical sales speak

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## First the positives and why we should cheer synthetic gypsum

Gypsum (Calcium sulfate) is derived from the Greek word gypsos for “chalk” or “plaster”. The most famous deposit of gypsum is located in the Montmartre district of Paris, France. The calcined or dehydrated gypsum produced is better known as “Plaster of Paris”. With the addition of water, calcined (dried under high heat) gypsum reverts to its regular or di-hydrate crystalline form causing the material to harden or set in ways useful for casting or building. Gypsum is moderately soluble in water at 2.5g/L @ 25°C in contrast to Portland cement.

Synthetic gypsum is one of the by products of “clean coal” technologies. Synthetic gypsum is formed through a process called flue gas desulfurization or FGD. A slurry of powdered limestone and water is sprayed in the flue gasses emitted from the boilers of a coal fire plant. The calcium carbonate (limestone) reacts with sulfur dioxide in the flue gas to form calcium sulfite; which then reacts with oxygen and water to form calcium sulfate or gypsum. Sulfur dioxide is a major contributor to “acid rain” formation so creating a market for synthetic gypsum benefits everyone.

Calcium sulfate or gypsum is a harmless compound that is typically found in natural sedimentary deposits all over the world. “Natural” gypsum is mined commercially however at a higher cost than it's synthetic counterpart. Synthetic and “natural” gypsum are both used in the production of drywall boards for building and construction. In fact 30% of all the drywall produced in the US is made from synthetic gypsum. Of the 21 drywall plants in the US operated by USG, nine use synthetic gypsum exclusively.

## Now the negatives

The use of synthetic gypsum may be beneficial in certain applications but lately it's finding it's way more and more into commercial flooring. Gypsum has been used for years as a component of concrete prep materials or cementitious compounds often referred to as skim coat or self leveler. These materials use a certain percentage of gypsum to achieve a cured surface more suited for sanding, to allow for feather finishing and to retard the set up times of Portland cements. At lower percentages the benefits are real. However, gypsum (being much cheaper to produce than Portland cement) is often incorporated at higher percentages to achieve cost savings. Since gypsum is moderately soluble, adding higher percentages in the formula for cementitious compounds can lead to disastrous results. Increasing the water solubility (hygroscopicity) of a prep material is very risky in high moisture installations. Exposure to high moisture environments can permeate the cured prep material relegating it to the consistency of molding clay. Additionally, if gypsum is present in high quantities then the prep material will hold more moisture, soften and eventually weaken the adhesive bond. To add insult to injury, most conventional flooring adhesives are water based acrylics and once cured become susceptible to alkaline attack above pH 10. This pH can develop from the concrete moisture, where a gypcrete-enriched (cheap) skim coat can only make matters worse by holding the moisture directly at the bond line and contributing to the overall increase in pH.

**Beware the marketing ploy that synthetic gypsum is less soluble than natural gypsum.** Gypsum is gypsum no matter the source. The physical properties of Calcium sulfate do not change because one batch is made in a lab, or at a coal-fire electric plant and the other batch is made courtesy of “Mother Nature”. Gypsum-enriched concrete prep materials (often referred to by the commercial name GYPCRETE) will spell disaster on your project if elevated moisture is identified. Even worse the resulting loss of adhesive integrity came at a price of \$10 to \$15 dollars per bag versus a better quality prep.

So how do you protect yourself and your clients? Specify the chemistry, not the vendor. Stipulate the use of low gypsum based prep materials. Write “prep materials not to be produced with high levels of Calcium sulfate”. Request all prep materials to be rated “moisture resistant” or “suited for exterior applications”. Talk about the performance you expect versus identifying a specific vendor over another. Nearly every manufacturer makes various grades of material. Just like anything else, if you want a material to provide a certain expectation of performance then you have to ask for it.