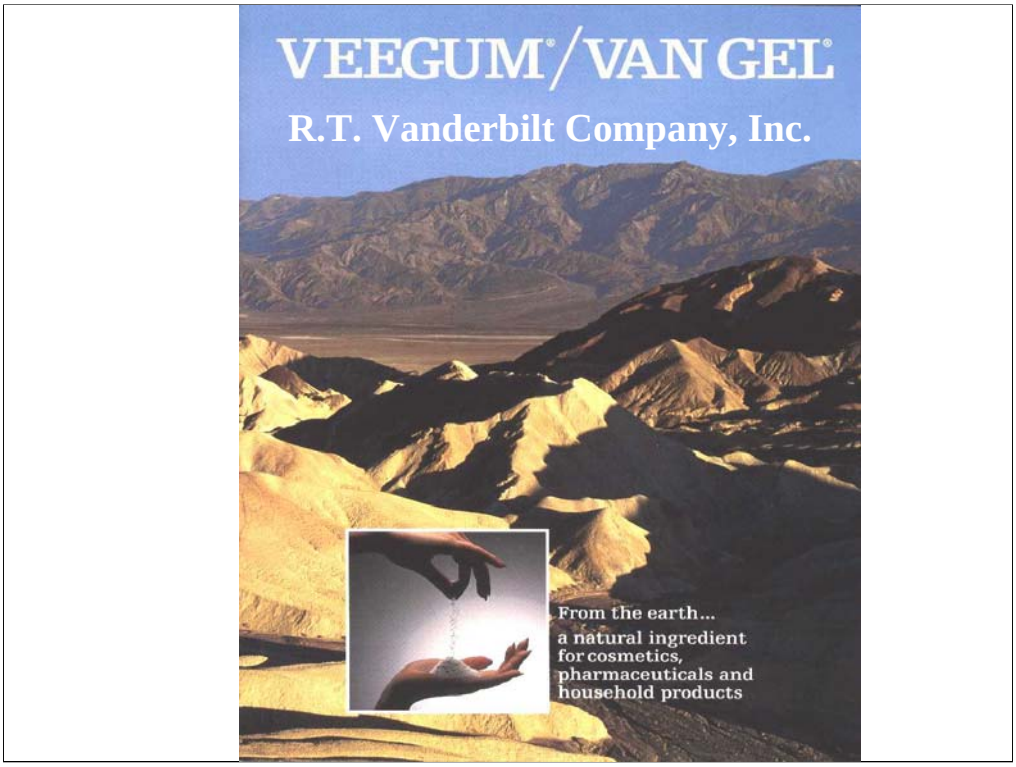


VEEGUM® Magnesium Aluminum Silicate

This presentation is available in three parts. This is Part 1.

Part 1:

What VEEGUM Magnesium Aluminum Silicate is

How it's made

How it works

- **Clay structure**
- **Hydration Mechanism**
- **Colloidal structure in water**

Part 2:

VEEGUM Magnesium Aluminum Silicate dispersion rheology

Effect of additives

Part 3:

Guidelines for best use

- Dispersion preparation
- Hydration time guide

Synergism with organic thickeners

VEEGUM Magnesium Aluminum Silicate grades

VEEGUM

Magnesium Aluminum Silicate

Purified Natural Smectite Clays That Impart Useful Rheological Properties

VEEGUM Magnesium Aluminum Silicate products are natural smectite clays that are water-washed to optimize purity and performance. Smectite clay, which is also known as bentonite, is valued for its ability to swell in water and to impart useful rheological properties to aqueous compositions.

VEEGUM

Magnesium Aluminum Silicate

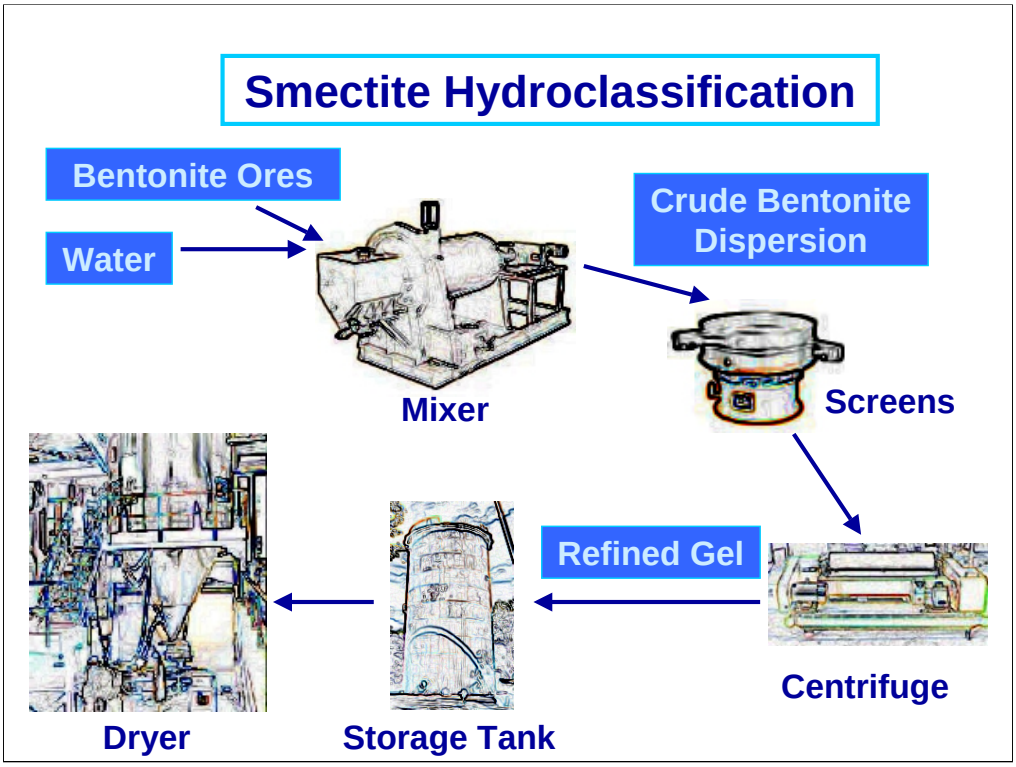
The formulator's choice to:

Stabilize Suspensions
Perfect Emulsions
Optimize Flow

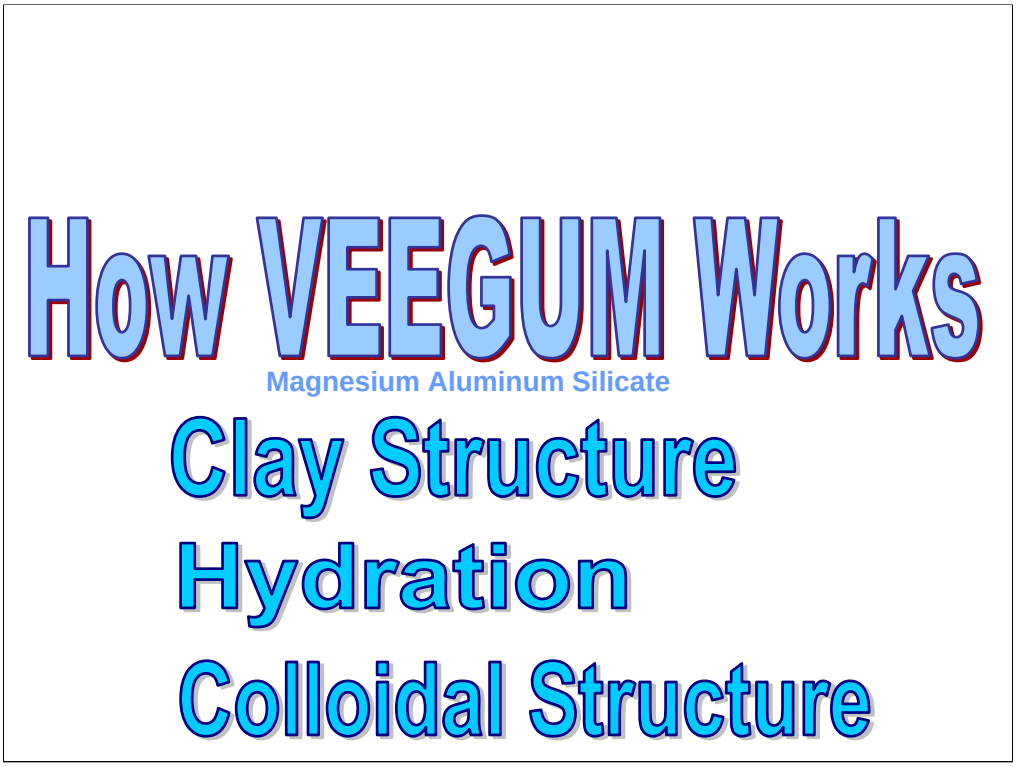
VEEGUM Magnesium Aluminum Silicate has been the formulator's choice for more than fifty years to stabilize suspensions, perfect emulsions and optimize flow properties.

R.T. Vanderbilt Company's diversified reserves in the U.S. southwest are the foundation of our clay's reputation for uniformity and quality. This secure resource base also enables the continuing development of new grades in response to customer needs.

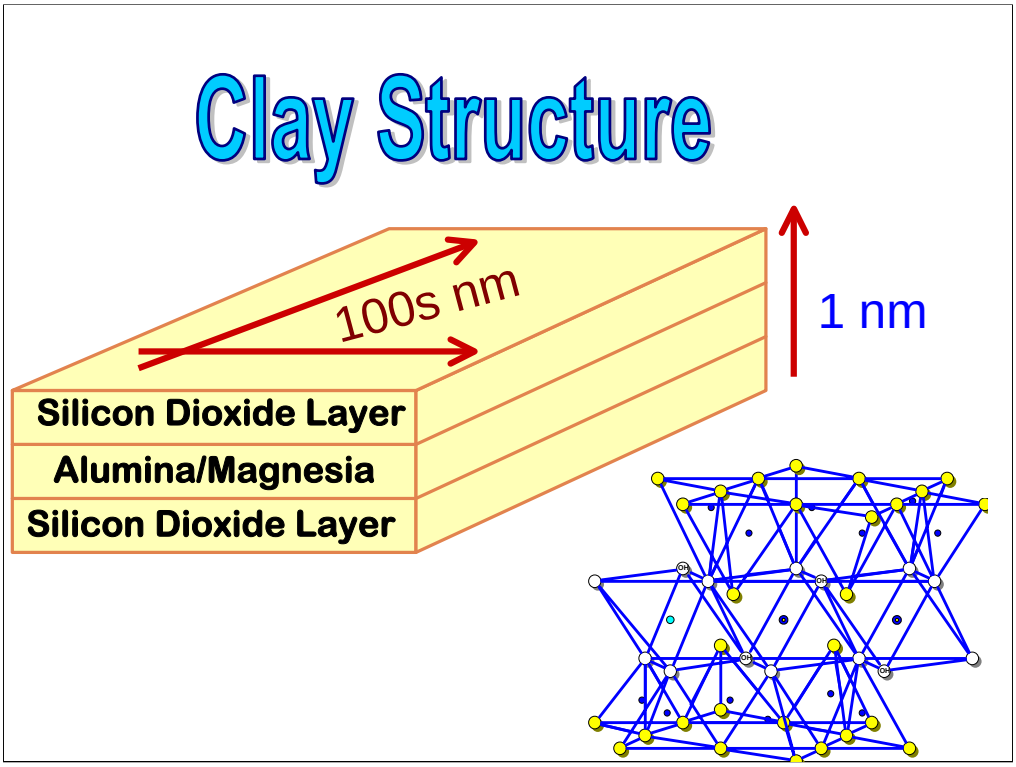
The smectite ores used to make **VEEGUM** Magnesium Aluminum Silicate products are mined in Nevada, Arizona and California. They are milled in Nevada and shipped to the Vanderbilt Minerals Corporation processing plant in Murray, KY.



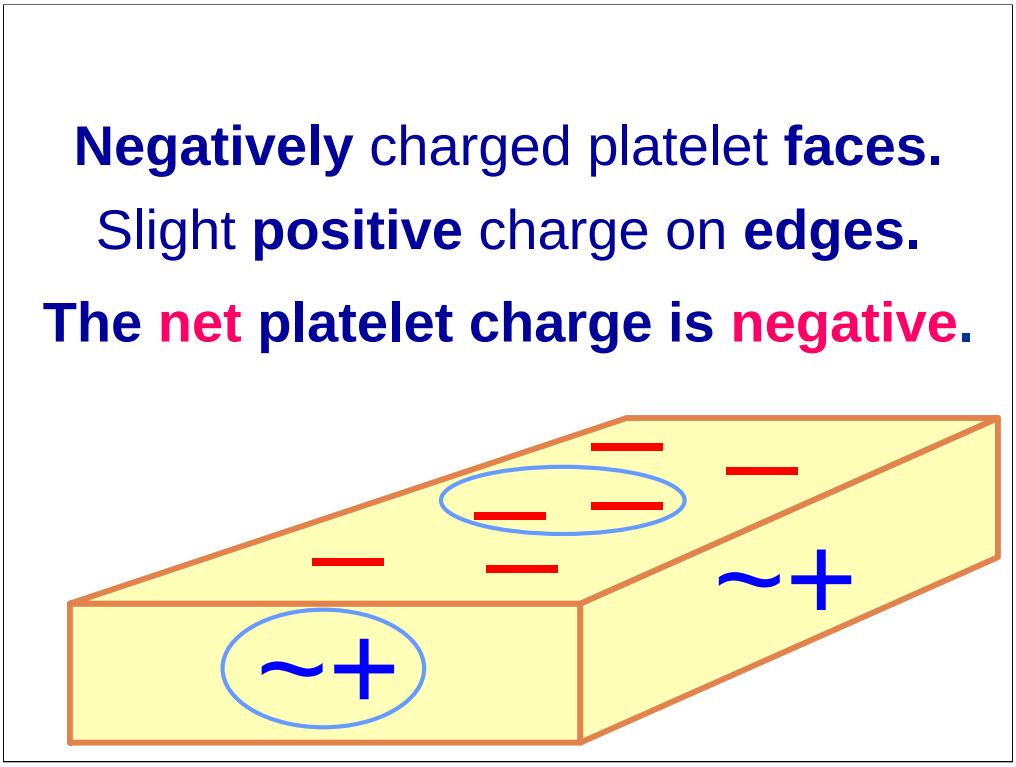
All grades of **VEEGUM** Magnesium Aluminum Silicate undergo the same water-washing process and meet the same standard of clay purity. The ores are first slurried in water. The non-clay fractions of the ore are then removed mechanically and centrifugally. The purified clay gel is collected and dried.



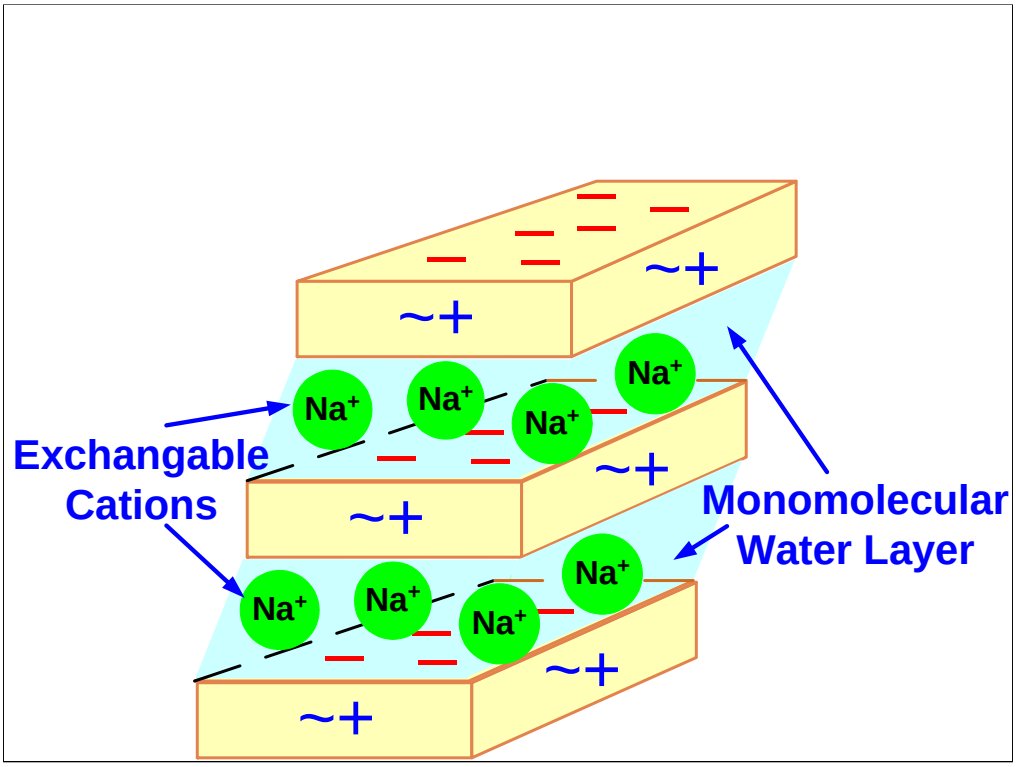
The way in which **VEEGUM** Magnesium Aluminum Silicate functions as a thickener and stabilizer in aqueous compositions is a result of the smectite clay structure, which accounts for the particular way in which this clay hydrates in water and forms the desired colloidal structure.



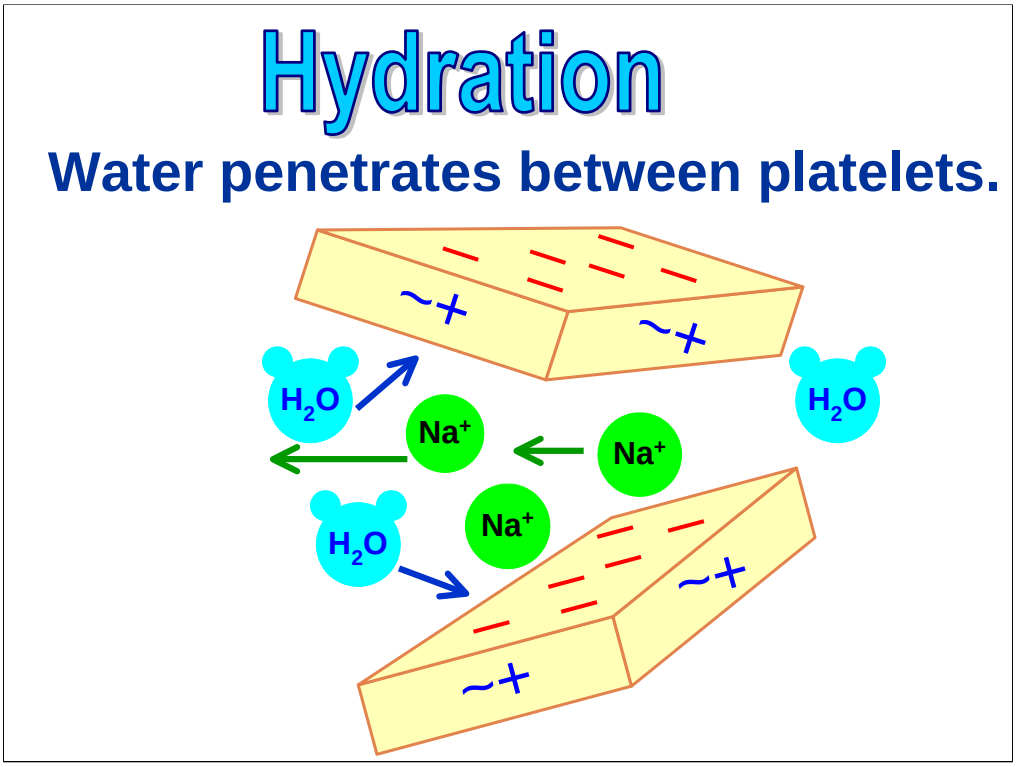
A single smectite platelet is composed of a central alumina or magnesia layer joined to silica layers. The particle is one nanometer thick and up to several hundred nanometers across.



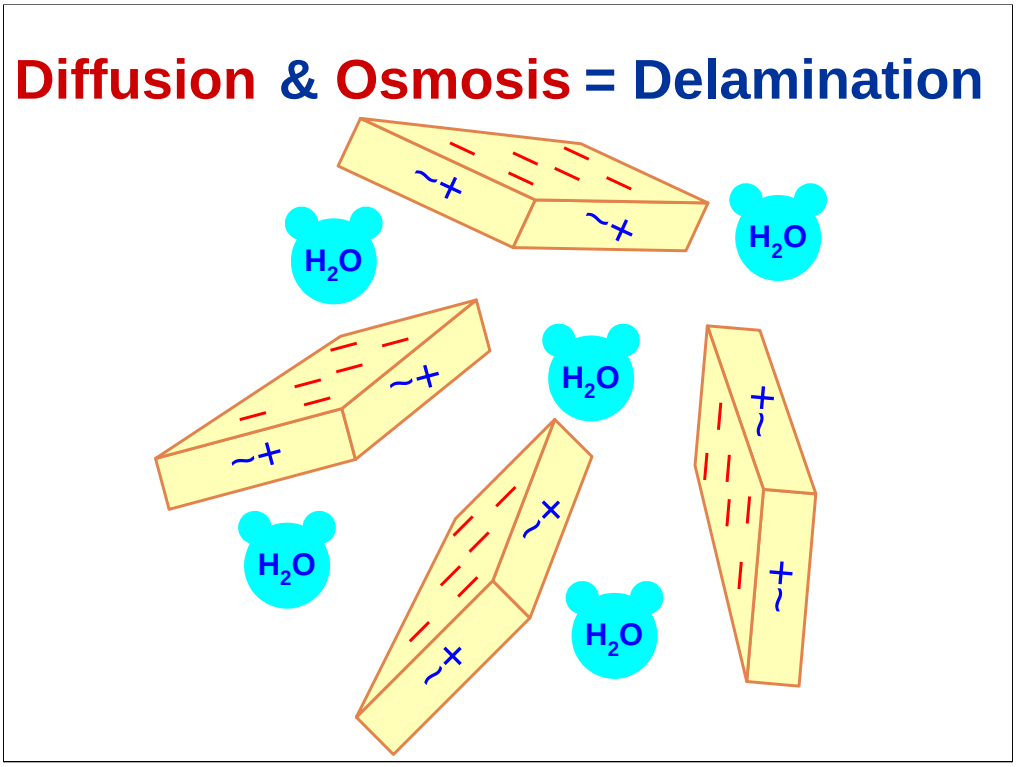
Substitutions within the crystal lattice result in negatively charged platelet faces. Lattice discontinuities account for a very slight positive charge on edges. The net platelet charge is negative.



The net negative charge on the platelet is mostly balanced by sodium ions, although other inorganic cations are present in minor amounts. These charge-balancing ions are associated with platelet faces and are termed “exchangeable” since they can be readily substituted with other cations. A macroscopic clay particle is composed of thousands of these sandwiched platelets with exchangeable cations and a layer of water between each.



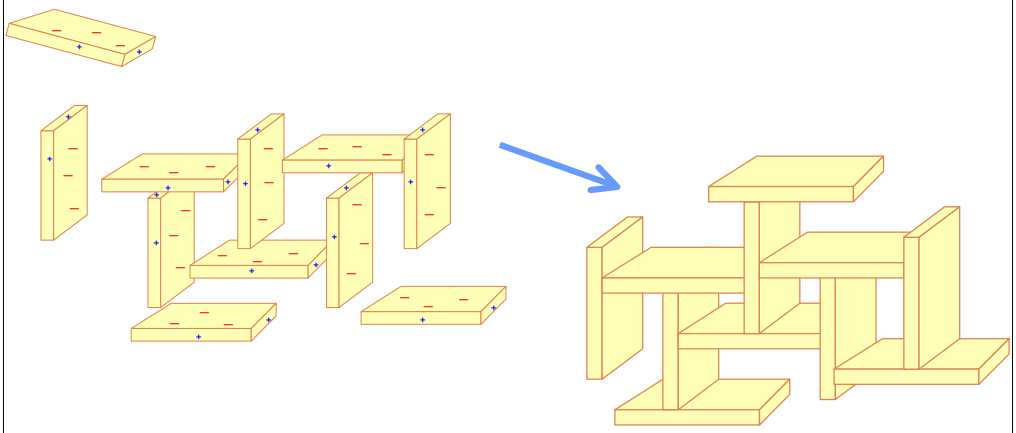
When clay and water are mixed, water penetrates between platelets forcing them further apart. The cations begin to diffuse away from platelet faces.



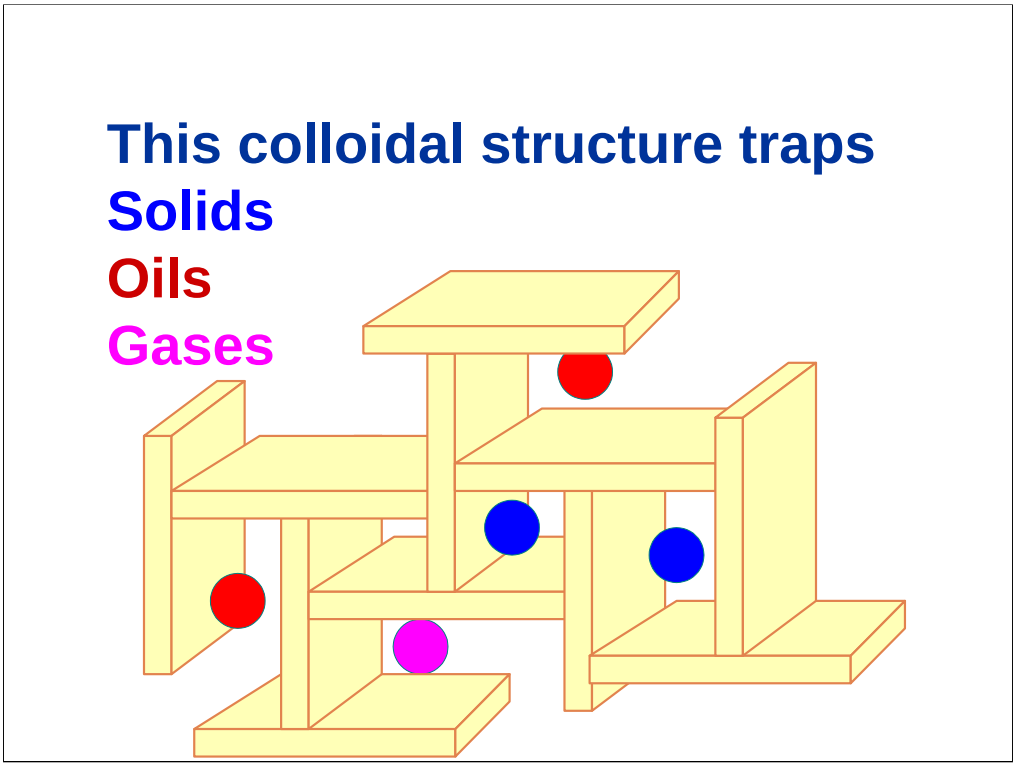
Diffusion – the movement of cations from between platelets out into the water - and osmosis – the movement of water into the space between platelets - then promote delamination until platelets are completely separated.

Colloidal Structure

Positive edges + negative faces = "house of cards."



Once the smectite is hydrated (i.e., the platelets are separated) the weakly positive platelet edges are attracted to the negatively charged platelet faces. A three dimensional colloidal structure forms, commonly called the "house of cards".



This colloidal structure is valued for its ability to trap and segregate solids, as in a suspension, oils, as in an emulsion, and gases, as in a foam or mousse.

A library of technical literature on the properties and uses of VEEGUM Magnesium Aluminum Silicate products is available for download at

www.rtvanderbilt.com

Please proceed to

Part 2:

VEEGUM Magnesium Aluminum Silicate dispersion rheology

Effect of additives