Lit. G-105 Revised 05/05/06 POLYMER GRADE MONTMORILLONITES

General Information:

Polymer grade (PG) montmorillonites are high purity aluminosilicate minerals sometimes referred to as phyllosilicates. They are intended for use as additives to hydrophilic polymers such as polyvinylalcohols, polysaccharides and polyacrylic acids. When fully dispersed in these host polymers they create a new category of composite materials called nanocomposites.

Loading Levels:

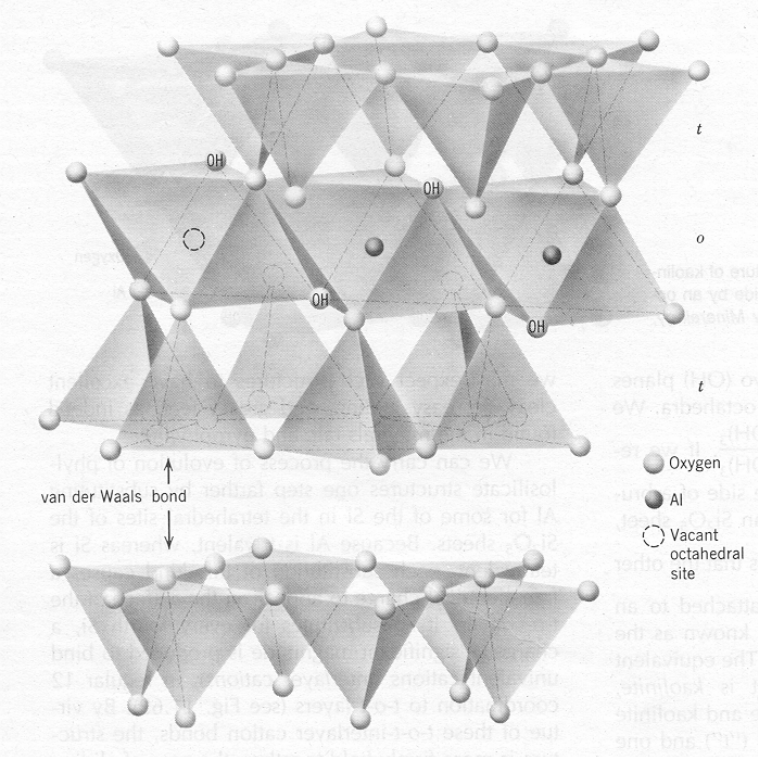
PG montmorillonites are used at loading levels ranging from 1-15% depending upon the degree of hydrogen bonding with the host polymer and the requirements of the application.

Morphology and Structure:

Montmorillonites have a sheet-type or platey structure. Although their dimensions in the length and width directions can be measured in hundreds of nanometers, the mineral's thickness is only one nanometer. As a result individual sheets have aspect ratios (L/w) varying from 200-1000, with a majority of platelets in the 200-400 range after purification.

The theoretical formula and structure for montmorillonite are:

$$M^{+}_{y}(Al_{2-y}\ Mg_{y})(Si_{4})\ O_{10}(OH)_{2*}\ nH_{2}O$$



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This exact formula is never seen in nature because central metal ions ($A1^{3+}$ and Si^{4+}) in the interior crystal lattice have been substituted for lower valance ions such as magnesium, iron, manganese and occasionally lithium. Substitution creates a charge imbalance on the flat surfaces of each platelet. The negative charge imbalance is neutralized by adsorption of hydratable cations, most notably sodium and calcium.

Adsorbed cations can be intentionally substituted by other hydratable cations including organic cations. The degree of potential substitution is expressed as cation exchange capacity, measured in milliequivalents of substitution per 100 grams of mineral.

Purity and Color:

All PG grades are purified to a level greater than 98% montmorillonite. Admixture minerals are generally those with specific gravities similar to montmorillonite and include albite, calcite, dolomite, orthoclase and quartz.

Color varies between grades. Color is the result of substitution by iron, titanium and manganese within the lattice structure and depends on the level of substitution and valence states of the cations. Because these metals occupy the central coordination positions within the structure, they cannot be economically removed.

PHYSICAL PROPERTIES

PROPERTY	PGW	PGV	PGN
Color	White	White	Off white
CEC (meq/100g) ±10%	145	145	120
Aspect Ratio	200-400	150-200	300-500
Specific Gravity	2.6	2.6	2.6
Maximum Moisture (%)	12%	18%	12%
pH (5% dispersion)	9.5-10.5	9-10	9-10

Availability:

PG montmorillonites are available in 20 kgs (44 lbs) bags or drums and one metric ton bulk bags.

For more information on how Nanomers® can work for you, contact Nanocor's Technical Service Group.

Nanocor
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