

# Huber's Thermoset Composites Selection Guide



HUBER ENGINEERED MATERIALS



Huber Engineered Materials is pleased to provide you with this handy Thermoset Composites Selection Guide which matches our myriad of Alumina Trihydrate (ATH) and Ground Calcium Carbonate (GCC) products with a number of popular applications.

Huber is one of the largest suppliers of ATH to the thermoset composites industry globally and our products fit a wide spectrum of applications. Also known as hydrated alumina, ATH is technically aluminum trihydroxide, with the chemical formula Al (OH)<sub>3</sub>. Huber's key ATH brands include our SB, Granite Elite<sup>®</sup>, Hydral<sup>®</sup>, Hymod<sup>®</sup> surface-treated, Micral<sup>®</sup>, MoldX<sup>®</sup> and Onyx Elite<sup>®</sup> grades.

GCC is one of the most widely used industrial minerals in the world, and Huber supplies a broad line of high performing products from three U.S. locations: Marble Hill, Georgia; Marble Falls, Texas; and Quincy, Illinois. GCC is an extremely versatile mineral and its widespread use in composites is due to a desirable combination of economic and physical characteristics such as availability, low cost, good color, low oil absorption



and a wide range of particle sizes. Look to the Hubercarb® W Series in thermoset composite applications for:

- Low Moisture Content
- Low Silica Content
- Chalk-Like Softness
- Rounded Particle Shape

Huber prides itself on a unique consultative selling process where our technical service and sales teams work together so our customers' situations and problems are understood and innovative products are customized for specific applications. ATH or GCC particle properties directly affect compound performance. For your specific application, let Huber assist you with a product recommendation based on our technical expertise. We look forward to working with you.

For more information about our ATH and GCC product portfolios, contact us:

Email: hubermaterials@huber.com Click: www.hubermaterials.com/thermosets Call: 1-866-JMHUBER (1-866-564-8237)





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## Thermoset Composites Select

	HUBER'S G	ROUND CALC	PRODUCTS						
THERMOSET COMPOSITES APPLICATIONS	Hubercarb <sup>®</sup> W3	Hubercarb <sup>®</sup> W4	Hubercarb <sup>®</sup> G260	Hubercarb <sup>®</sup> G325	Marble Elite <sup>®</sup> Alpha	Mo	oldX <sup>®</sup> 100	MoldX <sup>®</sup> A105	MoldX P18
Cast Polymer					•				
CIPP (Cured-In-Place-Pipe)									•
Continuous Panel									
Electrical Laminates	•	•					•		
Encapsulation / Potting									
Filament Winding	•	•		•					
Infusion Techniques	•	•							
Injection Molding									
Phenolic Molding									
Polyurethane Elastomer								•	•
Pre Form / Wet Mat	•	•							
Pultrusion	•	•							
RTM (Resin Transfer Molding)	•	•		•					
SMC / BMC	•	•					•		
Spray-Up / Hand Lay-Up			•	•			•		
Tooling Applications								•	
Vacuum Bag Molding								•	•

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MoldX <sup>®</sup> A100	MoldX <sup>®</sup> A105	MoldX <sup>®</sup> P18	Micral <sup>®</sup> 632	Micral <sup>®</sup> 932	Hymod <sup>®</sup> SB 432 Hyflex	Hymod <sup>®</sup> SB 432 CM	Hymod <sup>®</sup> SB 432 SH2	Hydral <sup>®</sup> 710	SB 136	SB 332	SB 336	SB 432	Granite Elite®	Onyx Elite <sup>®</sup>
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HUBER ENGINEERED MATERIALS









- Treated and Untreated Grades of Alumina Trihydrate (ATH) and Magnesium Hydroxide (MDH)
- Molybdate Complexes
- Non-Halogen
- Unsurpassed Technical Service



## "Flames and Smoke Don't Like Us"

When it comes to high performing, non-halogen fire retardant additives, Huber Engineered Materials is the only name you need to know. In addition to an innovative portfolio of alumina trihydrate (ATH) and magnesium hydroxide (MDH) products and molybdate complexes, Huber offers superior technical and customer service support.

We pride ourselves on a unique consultative selling process. Our technical service team works closely with sales so our customers' situations and problems are understood and products are customized for specific applications. Huber ATH, MDH and molybdate brands used in a myriad of industrial and consumer applications include:

- ✓ Hydral<sup>®</sup> Precipitated ATH
- ✓ Hymod<sup>®</sup> Surface-Treated ATH
- ✓ Kemgard<sup>®</sup> Flame Retardants and Smoke Suppressants
- ✓ Micral® ATH
- ✓ MoldX<sup>®</sup> Optimized ATH
- ✓ SpaceRite<sup>®</sup> Precipitated ATH
- ✓ Vertex<sup>®</sup> MDH
- ✓ Zeroġen® MDH

### Comparing ATH and MDH

#### Thermal decomposition reaction (endothermic):

 $2AI(OH)_3 \rightarrow AI_2O_3 + 3H_2O$  $Mg(OH)_2 \rightarrow MgO + H_2O$ 

 $\Delta H = -280 \text{ cal/g}$  $\Delta H = -328 \text{ cal/g}$ 

- Take heat away from the flame
- Water vapors dilute volatile polymer decomposition products (fuel)
- Form protective metal oxide layer on polymer surface

Neither ATH nor MDH contain halogen. When exposed to heat, these metal hydroxides decompose to form water molecules in an endothermic reaction. This results in reduced flame spread and smoke generation.



The graph above shows that MDH decomposes at a higher temperature than ATH, making it useful for engineering thermoplastic resins such as polyamides and polypropylene.

#### Physical Property Comparison of ATH and MDH

Property	ATH	MDH
Physical form	Powder	Powder
Particle morphology	Hexagonal platelet	Hexagonal platelet
Color	White	White
Specific gravity, g/cm <sup>3</sup>	2.42	2.36
pH value	9 - 10	10 - 11
Mohs hardness	2.5 - 3.5	2.0 - 3.0
Refractive index	1.57	1.58
Decomposition temperature	220°C / 428°F	330°C / 626°F
Heat of decomposition, cal/g	280	328
Theoretical loss on ignition	34.6%	31.0%





## Huber's Key ATH and MDH Product Offerings

Untreated ATH products	Median particle size, microns	Description	Applications
SB 30	90	Coarse ATH	Applications tolerating coarse top size
SB 36	25	Coarse ground ATH	Carpet backing; Epoxy potting / Encapsulation
SB 136	19	Ground ATH	SMC / BMC; Hand lay-up; Epoxy potting / Encapsulation
SB 332	11	Ground ATH	SMC / BMC; Hand lay-up; Wet mat; Laminating
SB 336	15	Ground ATH	SMC / BMC; Hand lay-up; Wet mat; Laminating
SB 432	9	Ground ATH	SMC / BMC; Hand lay-up; Wet mat
SB 632	3.6	Ground ATH	Polyurethane foam; Latex-based formulations
Micral <sup>®</sup> 532	5	Ground, fine ATH	Wall coverings
Micral <sup>®</sup> AM550	5	Ground, fine ATH	Coatings; Adhesives; Epoxy
Micral <sup>®</sup> 632	3.5	Ground, fine ATH	SMC / BMC; Silicone elastomers; Ceramics; Rubber
Micral <sup>®</sup> 932	2	Ground, ultrafine ATH	SMC / BMC; Pultrusion; Gel coats; Silicone elastomers; Rubber
Micral <sup>®</sup> 1500	1.5	Ground, ultrafine ATH	Wire & cable; Silicone elastomers; Coatings
Treated ATH products	Median particle size, microns	Description	Applications
Hymod <sup>®</sup> SB432 SG	9	Ground ATH; Hydrophobic treatment	High-moisture environments
Hymod <sup>®</sup> SB432 SH2	9	Ground ATH; Alkyl functional	Cured-in-place-pipe (CIPP)
Hymod <sup>®</sup> M632 SP	3.5	Ground ATH; Vinyl functional	Peroxide-cured silicone rubber
Hymod <sup>®</sup> M1500 SPD	1.5	Ground ATH; Vinyl functional	Rubber
Optimized ATH products	Median particle size, microns	Description	Applications
MoldX <sup>®</sup> A100	10	Optimized ATH	SMC / BMC; Epoxy potting
MoldX <sup>®</sup> P18	5.5	Optimized ATH	Pultrusion; Resin infusion; Vacuum bag molding
Precipitated ATH products	Median particle size, microns	Description	Applications
Hymod <sup>®</sup> M9400 SF	1	Precipitated ATH; Phenyl functional	PVC; Wire & cable
Hymod <sup>®</sup> M9400 SP	1	Precipitated ATH; Vinyl functional	Peroxide-cured silicone rubber; High-voltage insulators
Hymod <sup>®</sup> M9400 SG	1	Precipitated ATH; Alkyl functional	Platinum-cured silicone rubber
Hydral <sup>®</sup> 710	1	Precipitated ATH	Wire & cable; Silicone elastomers; Coatings
Hydral <sup>®</sup> PGA-SD	1	Precipitated ATH	Wire & cable
SpaceRite <sup>®</sup> S-3	1	Precipitated ATH	Glossy coatings; Color pigment extender
MDH products	Median particle size, microns	Description	Applications
Vertex <sup>®</sup> 60	2.8	Untreated coarse MDH	Roofing membrane; Rubber compounds
Vertex <sup>®</sup> 100	1.5	Untreated fine MDH	Wire & cable jacketing; Conduit
Zerogen <sup>®</sup> 50	1	Untreated purified MDH	Wire & cable; Electrical & electronics
Zerogen® 100	0.7	Untreated MDH	Wire & cable; Electrical & electronics



## **Applications and Huber Product** Offerings for Flame Retardance and **Smoke Suppression**

#### 1. Fiberglass Reinforced Polyester Molding and Pultrusion

- Ground ATH 3 to 25 microns
- → SB grades
- → Micral<sup>®</sup> grades
- $\rightarrow$  MoldX<sup>®</sup> Optimized ATH grades

ATH is a cost-effective, non-reactive flame retardant used in a wide variety of molding compounds. Huber has a complete range of particle sizes to allow the compounder to achieve high loadings of ATH which improve flame retardant performance and reduce the amount of resin in SMC, BMC, pultrusion and other molding applications.

#### 2. Wire and Cable Compounds

Treated precipitated and ground ATH Untreated ATH 1-6 microns Treated and untreated MDH Molybdates

- → Hymod<sup>®</sup> grades
- → Hydral<sup>®</sup> and Micral<sup>®</sup> grades
- → Vertex<sup>®</sup> and Zerogen<sup>™</sup> grades
- → Kemġard® ġrades

Wire and cable applications require flame retardance and low smoke generation. Huber has a full line of molybdate and treated ATH and MDH products that impart outstanding smoke suppression in thermoplastic wire and cable products. Especially in high performance applications, chemically-treated ATH and MDH products offer these advantages compared with untreated ATH: • Increases color stability

- Improves dispersion uniformity Higher throughput rates
  - - Improves physical properties and electrical performance



### 3. Engineering Thermoplastics

Enhances flame retardant performance

Treated MDH	→ Vertex <sup>®</sup> ġrades
Molybdates	→ Kemġard® ġrades

The MDH decomposition temperature of 330°C (626°F) makes it ideal for use in thermoplastic systems which compound at high temperatures such as:

Polypropylene

- Polycarbonate
- Polybutylene Terephthalate (PBT)

 Polyamide Huber's product line includes amino functional, silane-treated MDH, which works well in polyamide systems. Polyamide formulations containing Kemgard<sup>®</sup> 981 and antimony oxide have improved thermal stability properties versus using antimony oxide alone.

### 4. Roofing Membranes

Untreated ATH	→ Micral® ġrades
Treated ATH	→ Hymod <sup>®</sup> grades
Treated MDH products	→ Vertex <sup>®</sup> 60 series

Huber developed surface-modified ATH and MDH products to provide outstanding physical properties, water-resistance, fast dispersion and flame retardant performance for membranes used in roofing applications. MDH is an excellent flame retardant, but its high polarity surface makes it somewhat incompatible with low polarity elastomers such as EPDM rubber and thermoplastic polyolefin (TPO). Treating the surface of the MDH allows its flame retardant performance to be incorporated into roofing membranes.



#### 5. Cured-In-Place-Pipe (CIPP)

Hymod<sup>®</sup> SB 432 SG

Huber developed this ideal surface modified Hymod<sup>®</sup> grade to optimize loading and increase resistance to settling and corrosion.

#### 6. Silicone Rubber

Treated precipitated and ġround ATH → Hymod<sup>®</sup> SP and SG ġrades

ATH is used in silicone rubber to reinforce the compound and impart arc track resistance. In order to achieve outstanding physical and electrical performance in peroxide cured silicone rubber compounds, Huber developed its SP surface treatment products. Its low surface energy facilitates mixing and allows for high pigment loadings. The compounds do not stick to molds and remain very hydrophobic. Hymod<sup>®</sup> M9400 SP is specifically designed for high voltage silicone rubber insulators.

#### 7. Rubber

Untreated ATH Treated ATH Molybdates

- → SB and Hydral<sup>®</sup> grades
  → Hymod<sup>®</sup> grades
- → Kemġard® ġrades

ATH is commonly used in organic rubber compounds such as EPDM, EVA and SBR for smoke suppression and flame retardance in applications such as belts, hoses and carpet backing. An example is the mining industry, which has established new non-halogen fire retardant Mine Safety and Health Administration (MHSA) requirements. ATH and Kemgard products can be used in mining applications.

#### 8. Adhesives, Caulks and Sealants

Untreated ATH	$\rightarrow$	SB and Micral® grades
Treated ATH	$\rightarrow$	Hymod <sup>®</sup> grades
Molybdates	$\rightarrow$	Kemgard® grades

Some adhesives, caulks and sealants used for automotive and building material applications are required to meet certain criteria for flame retardance and low smoke generation.

#### 9. Carpet Backing

Untreated ATH	→ SB grades
Molybdates	→ Kemġard® ġrades

Latex, urethane and vinyl binders are used in carpet manufacturing and are all flammable. Coarse ATH is a standard flame retardant for commercial and industrial carpet applications, and molybdates help to reduce smoke generation.

#### 10. Coatings

Untreated ATH

→ SB , Micral<sup>®</sup> and SpaceRite<sup>®</sup> grades

SB 432 is the standard ATH grade that has been used for elastomeric roof coatings for over 20 years. Gel coats used in thermoset applications often contain ATH. Fine particle size grades of ATH such as SpaceRite<sup>®</sup> S-3 can effectively extend white and color pigments in coatings while maintaining high gloss.











### Huber Flame Retardant Surface Treatments Increase Performance

To aid processing and improve physical, electrical, flame or chemical resistance properties, Huber has developed a broad line of high performing surface-modified grades. Surface treatments applied to metal hydroxides can benefit you in the following three areas:

#### 1. Powder Handling and Storage

- ✓ Increase shelf life (MDH)
- ✓ Reduced moisture absorption (during storage)
- ✓ Improved powder flow

#### 2. Compounding and Processing

- ✓ Improved compatibility with polymer
- ✓ Better wet-out
- ✓ Better, faster dispersion
- Lower viscosity, higher loadings
- ✓ Greater throughput rate
- ✓ Color stability
- Reduced absorption of expensive additives
- Improved cure properties

#### 3. Polymer Compound Performance

- Hydrophobicity, lower water pick-up
- Improves initial and aged mechanical properties
  - Tensile
  - Flexural
  - Impact / Toughness
- Improves initial and aged electrical properties
- ✓ Thermal stability
- ✓ Weatherability
- ✓ Fire retardancy
- ✓ Compound color

## Huber's ATH and MDH Surface Treatments

Surface treatment	Base metal hydroxide	Polymer type	Performance benefits
SP Vinyl Silane	ATH, MDH	Polyolefins; Silicone elastomers	Mechanical properties; Flame retardance (FR)
SG Hydrophobic Silane	ATH, MDH	Polyolefins; Epoxy; Urethane; Polyester; Silicone elastomers	Low viscosity; Hydrophobicity
SF Phenyl Silane	ATH, MDH	PVC	Improved dynamic thermal stability; Hydrophobicity; Color
SA Amino Silane	ATH, MDH	Polyamides; Epoxy; Polyolefins	Low temperature properties; FR
SV Proprietary	MDH only	Polyolefins	FR (lower smoke, higher limiting oxygen index)
CM Surfactant	ATH only	Epoxy; Urethane; Polyester	Low Viscosity; Improved dispersion
SL Stearate	ATH only	Polyolefins	Low viscosity; Improved dispersion
SC Methacryl Functional	ATH only	Acrylics; Polyester	Resistance to stress whitening
ST Stearate / HST Stearate	ATH, MDH	Polyolefins; PVC	Processability; Improved dispersion
Hyflex Ether Silane	ATH, MDH	Epoxy; Urethane; Polyester	Low viscosity; Improved dispersion
SN Vinyl Functional	MDH only	Polyolefins; Silicone elastomers	Processability; Mechanical properties

The selection of a specific surface treated or untreated ATH or MDH grade is based on the chemical properties of the polymer system. Huber's technical staff is ready to assist customers in identifying or customizing the best ATH and MDH product for your application. Huber has created a brochure that details the benefits of using surface modified grades. Request your copy today by contacting us at 1-866-JMHUBER (1-866-564-8237) or visiting hubermaterials.com.

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## Kemgard<sup>®</sup> Flame Retardants and Smoke Suppressants

Huber's Kemgard<sup>®</sup> flame retardants and smoke suppressants chemically influence the formation of organic char, effectively insulating the polymer from the heat and oxygen source thereby lowering heat and smoke release. Kemgard grades are manufactured by patented processes in which molybdates are precipitated on an inert core. This "coated core" approach makes more efficient use of the molybdate species by maximizing the active surface area, and at a much lower cost than pure molybdate chemicals, such as ammonium octamolybdate (AOM).



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## Huber's Key Kemgard<sup>®</sup> Product Offerings

Kemgard products (White powder appearance)	Median particle size, microns	Specific gravity	Description	Applications
Kemgard <sup>®</sup> 425	2.6	3	Calcium molybdate zinc complex	Flexible PVC; Calendered film; Caulks, adhesives & sealants; Wallpaper
Kemgard <sup>®</sup> 501	3.7	2.9	Calcium molybdate complex	Flexible PVC; Rigid PVC; Wire & cable; Calendered film; Caulks, adhesives & sealants; Epoxy; Wallpaper
Kemgard <sup>®</sup> 911A	2.7	3	Calcium molybdate zinc complex	Flexible PVC; Calendered film; Caulks, adhesives & sealants; Wallpaper
Kemgard <sup>®</sup> 911B	2.3	5.1	Basic zinc molybdate compound	Flexible PVC; Wire & cable; Calendered film; Caulks, adhesives & sealants; Epoxy; Wallpaper
Kemgard <sup>®</sup> 911C	3.3	2.8	Zinc molybdate / Magnesium silicate complex	Flexible PVC; Rigid PVC; Wire & cable; Carpet backing; Polyamide; Calendered film; Caulks, adhesives & sealants; Epoxy; Polyolefins; Electrical connectors; Wallpaper; Neoprene rubber; Vinyl plastisol
Kemgard <sup>®</sup> 981	4.4	4.2	Basic zinc phosphate complex	Flexible PVC; Polyamide; Calendered film; Caulks, adhesives & sealants; Polyolefins; Electrical connectors; Polyester
Kemgard <sup>®</sup> 1100	2	2	Zinc molybdate / Magnesium silicate complex	Flexible PVC; Rigid PVC; Wire & cable; Polyamide; Calendered film; Epoxy; Electrical connectors
Kemgard <sup>®</sup> HPSS	2.3	3.5	Basic zinc molybdate / Magnesium hydroxide complex	Flexible PVC; Wire & cable; Carpet backing; Epoxy; Vinyl plastisol
Kemgard <sup>®</sup> MZM	2	2.6	Zinc molybdate / Magnesium hydroxide complex	Flexible PVC; Rigid PVC; Wire & cable; Polyamide; Calendered film; Caulks, adhesives & sealants; Epoxy; Polyolefins; Polyester
Kemgard <sup>®</sup> 700Z	2.5	3.0	Zinc molybdate / Zinc borate complex	Polyolefins; PVC; Polyamide





## Huber's Superior Technical Service Expertise

Huber's unsurpassed technical expertise is its foundation in developing innovative fire retardant additives that meet the exacting requirements for each application. In addition, at our modern technical center in Fairmount, Georgia (U.S.), scientists work directly with customers in conducting extensive testing to replicate application situations and problems so tailored solutions are developed.

### **Fire Testing Capabilities**

- ASTM E1354: Cone Calorimeter
- ASTM E662: NBS Smoke Chamber
- ASTM D3806: Two-Foot Tunnel
- ASTM D2863: Limiting Oxygen Index
- UL 94: Horizontal and Vertical Burn Tests
- ASTM E648: Radiant Panel

### **Huber Technical Information Available**

Huber has additional technical information available specific to each of the products we've discussed in this brochure. This information can be accessed by visiting our website, www.hubermaterials.com and clicking on our Product Finder. You can also contact us, and we'll be happy to provide you with the product information you are seeking.

## Let Us Go To Work For You: Contact Us Today

Call: 866-JMHUBER (866-564-8237) Click: hubermaterials.com Email: hubermaterials@huber.com



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