



Highly Effective Fire Retardant and Smoke Suppressant Solutions for Polyvinyl Chloride Applications



Safe, sustainable and efficient alternative for antimony trioxide (ATO) in PVC



Kemgard[®] 

MOLYBDATE COMPLEX

Replacing Antimony Trioxide (ATO) in PVC

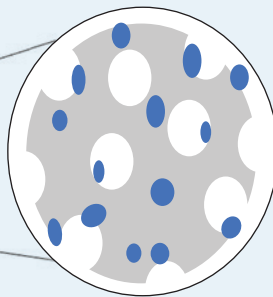
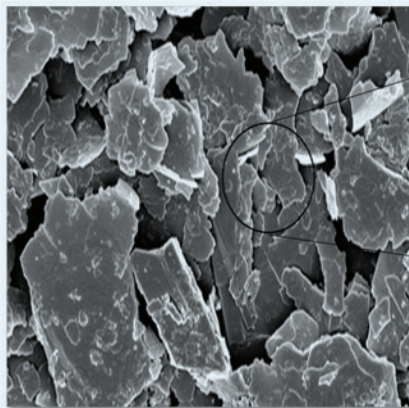
Kemgard® molybdate technology offers multifunctional solutions to fully replace antimony trioxide (ATO) in PVC formulations

The long-term use of antimony trioxide (ATO) is among the topics of broad concern to polyvinyl chloride (PVC) compound suppliers as well as their end users. Existing and emerging regulatory mandates have continued to drive an industry-wide effort to minimize the use of ATO in PVC, while maintaining adequate fire performance in a variety of applications such as rigid profiles, pipes, laminated textiles, thin films, adhesives and the production of wire & cable products.

Finding a safe and cost-effective alternative to ATO in PVC on a 1:1 basis has been a monumental challenge for the global research community for decades. ATO itself has no fire retardant (FR) function, however, when it is used together with halogenated compounds, the synergistic effect of the mixture creates the FR properties. ATO reacts with a halogenated compound to form antimony chlorides and

oxychlorides which act as radical scavengers in the gas phase.

Kemgard® products have been specifically designed to be highly effective smoke suppressants, char formers and fire retardants for a wide range of PVC applications and processing conditions. Kemgard® halogen-free smoke suppressants are manufactured by a patented process in which molybdates are precipitated on a functional core material. This “coated core” approach makes more efficient use of the molybdate species by maximizing its active surface area, while combining it with a selected core material that can offer additional benefits like additional fire retardancy, improved processability or increased thermal stability. This innovative technology combined with Huber’s application expertise has successfully replaced ATO and zinc borate in the most demanding PVC applications.



- Active Precipitate
- Core Material

Core Coverage: varies by product

Primary FR Benefit:

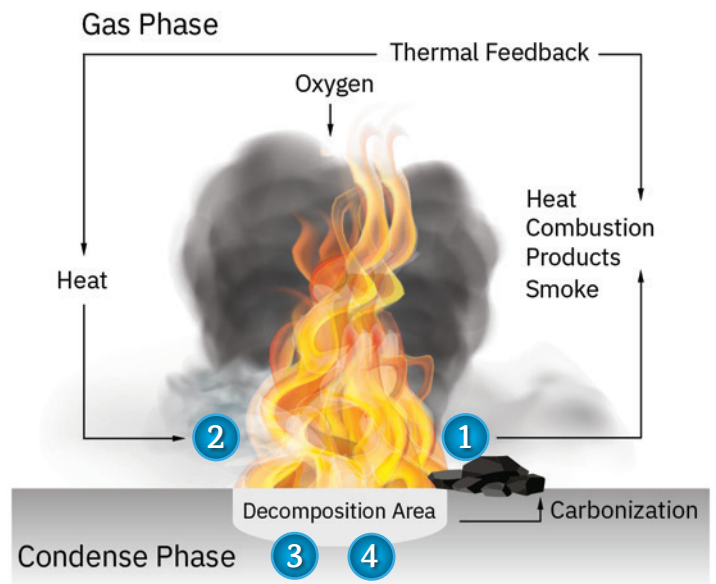
Highly efficient molybdate chemistry helps “catalyze” cross-linking in the PVC matrix leading to improved organic char formation effectively insulating the polymer from the heat and oxygen source thereby lowering heat and smoke release.

Secondary FR Benefit:

Depending on core material (e.g., ATH), new complexes may offer additional fire retardance benefits.

Kemgard® smoke suppressants are designed to support numerous FR mechanisms:

- 1 Improving char formation by catalyzing crosslinking in the PVC matrix
- 2 Promoting smoke suppression by limiting heat and oxygen to penetrate the surface
- 3 Acting as heat sink by decomposing endothermically
- 4 Reducing heat and smoke by releasing H₂O (depending on core material)



Kemgard® for PVC Laminated Textiles and Thin Films

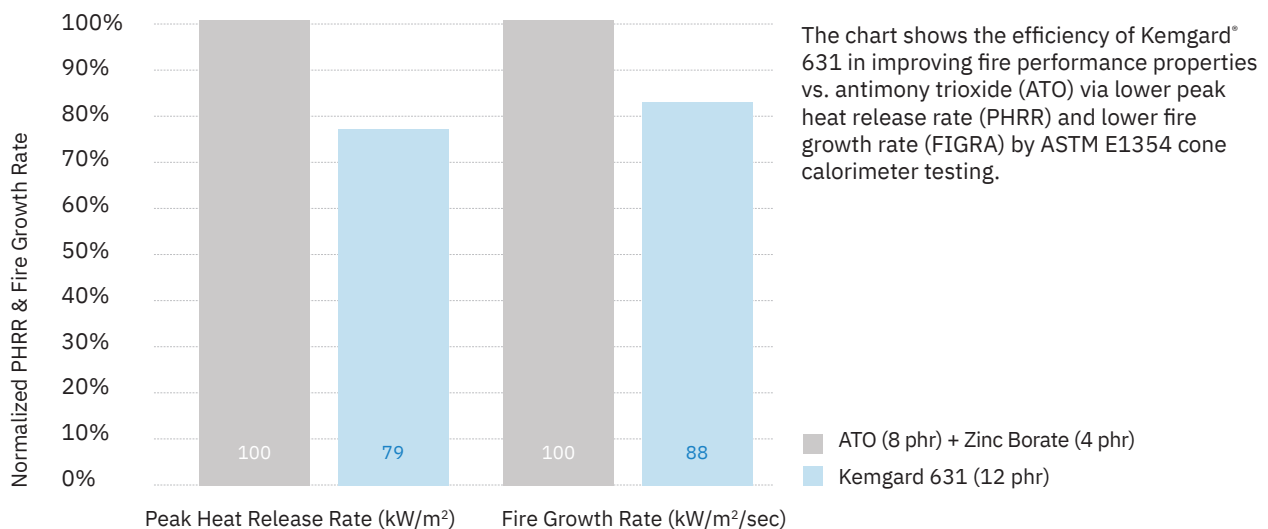
PVC Applications Where Part Thickness is <20 Mil (0.05 cm);
Used for both Calendaring and Plastisol Dip Processes

Examples: Automotive Seat Coverings, Awnings / Tarps / Tents, PVC Roofing Membrane

PVC Laminated Textiles and Thin Films	Huber Base Recommendation		
	Typical Fire Retardant Additive Recommendation	Standard Grade	High Performance Grade
	Antimony Trioxide (6-10 phr) + Zinc Borate (6-10 phr)	Kemgard® 631 (10-20 phr)	Kemgard® 911B (10-20 phr)
MODE OF ACTION			
Gas Phase Fire Retardant	+++	++	0
Endothermic Fire Retardant	0	+++	+
Char Forming Fire Retardant	+	+	+++
FLAME and SMOKE IMPACT			
Flame Spread	++	+++	++
Smoke Suppression	0	+	+++
Key Benefits		Helps to simplify formulations, can replace both Antimony trioxide and Zinc Borate at 1:1 use level in most formulations	Highly efficient fire retardant and smoke suppressant for FR rated PVC plastisol formulations. Can replace Antimony trioxide and Zinc Borate in most formulations

+++ = Enhanced Positive Impact ++ = Strong Positive Impact + = Positive Impact 0 = No Positive Impact

Fire Retardant Efficiency of Kemgard 631



Kemgard® for PVC Wire and Cable

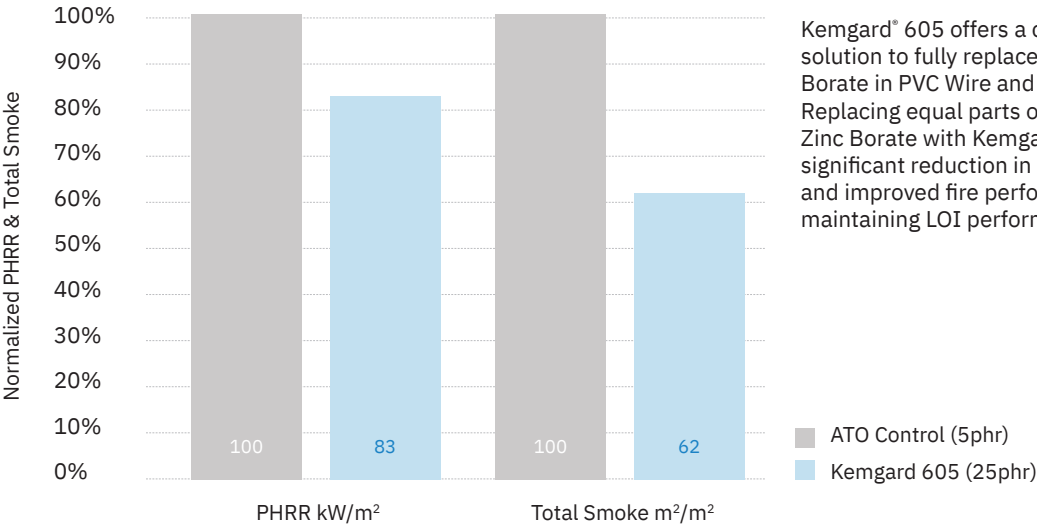
Low-Smoke PVC Wire & Cable Applications

Examples: PVC Riser, Low-Smoke PVC Wire & Cable (i.e., Plenum - North America) and Construction Products Regulation (Europe & Asia)

Huber Base Recommendation			
PVC Laminated Textiles and Thin Films	Typical Fire Retardant Additive Recommendation	Standard Grade	High Performance Grade
	Antimony Trioxide (6-10 phr) + Zinc Borate (2-6 phr)	Kemgard® 605 (15-30 phr)	Kemgard® 3001 (10-20 phr)
MODE OF ACTION			
Gas Phase Fire Retardant	+++	0	+
Endothermic Fire Retardant	0	+++	++
Char Forming Fire Retardant	+	+	+++
FLAME and SMOKE IMPACT			
LOI	+++	+	++
Flame Spread	++	+++	++
Smoke Suppression	0	++	+++
Key Benefits		Kemgard 605 includes replacing the entire FR package (ATO, zinc borate & calcium carbonate). Safe & lower cost option to the use of antimony based FR synergists	Zinc-free, high efficient multifunctional char former and smoke suppressant

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Fire Retardant Efficiency of Kemgard 605



Kemgard® 605 offers a cost-effective solution to fully replace ATO and Zinc Borate in PVC Wire and Cable applications. Replacing equal parts of CaCO₃ + ATO + Zinc Borate with Kemgard 605 results in a significant reduction in smoke generation and improved fire performance while maintaining LOI performance.

Kemgard® Solutions for Rigid PVC Profiles and Pipes

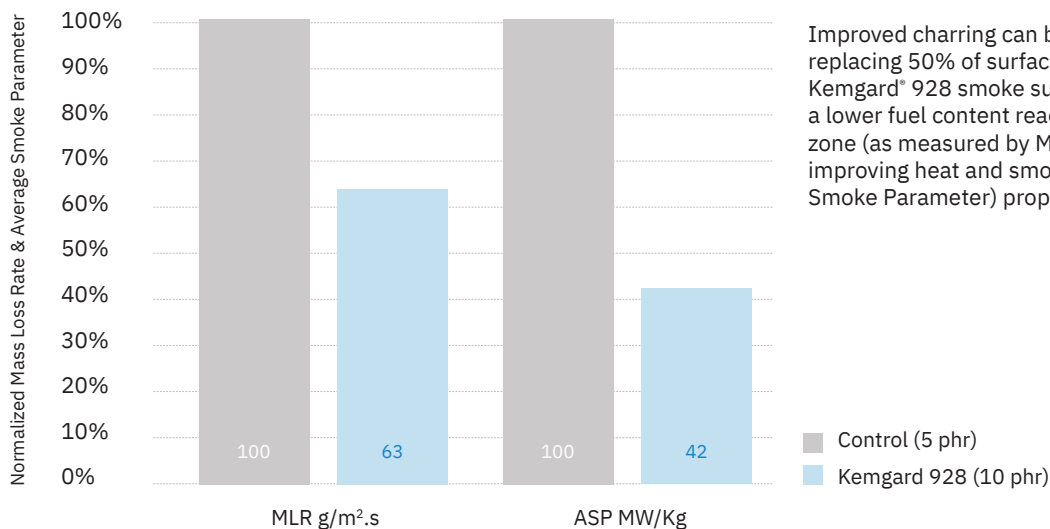
Rigid & Semi-Rigid PVC Applications Requiring Improved Fire and Smoke Performance

Examples: PVC Wall panels, Clean Room Panels, Composite Decking & Siding, Low-Smoke PVC Pipe (i.e., Drain Waste Vent, Fire Sprinkler)

PVC Rigid Profiles and Pipes	Typical Fire Retardant Additive Recommendation	Huber Base Recommendation	
		Standard Grade	High Performance Grade
	Zinc Hydroxystannate or Ammonium Octamolybdate (3-10 phr)	Kemgard® 928 (10-20 phr)	Kemgard® 984 (10-20 phr)
MODE OF ACTION			
Gas Phase Fire Retardant	++	0	0
Endothermic Fire Retardant	0	++	0
Char Forming Fire Retardant	+++	++	+++
FLAME and SMOKE IMPACT			
Flame Spread	++	++	++
Smoke Suppression	+++	++	+++
Key Benefits		Wide processing window FR & smoke suppressant additive	Very efficient char promotion via molybdate promoted crosslinking leads to improved FR performance

+++ = Enhanced Positive Impact ++ = Strong Positive Impact + = Positive Impact 0 = No Positive Impact

Fire Retardant Efficiency of Kemgard 928



Improved charring can be observed when replacing 50% of surface treated CaCO₃ with Kemgard® 928 smoke suppressant resulting in a lower fuel content reaching the combustion zone (as measured by Mass Loss Rate) thus improving heat and smoke release (Avg. Smoke Parameter) properties.



Global Leader in Halogen-Free Fire Retardant and Smoke Suppressant Solutions

Our passion and commitment toward innovation is reflected in our vision: Leading in innovative and sustainable material solutions

Harnessing trends to touch lives

Huber Advanced Materials is a global leader in halogen-free fire-retardant additives, specialty aluminas, organic matting agents and carriers and thermal management solutions

Huber is committed to delivering real value to customers and consumers through high-impact solutions, driven by customer insights and deep technical application expertise. Our solutions touch the lives and enhance the safety of millions of people on a daily basis.

Innovation is our foundation to achieve sustainable growth. We capitalize on major megatrends like sustainability, e-mobility, connectivity and urbanization. Our scientists collaborate with universities, research and test institutions and customers to develop new know-how and innovative solutions. We have dedicated resources in place to explore novel applications as growth platforms for the future.



Safeguarding our planet

Fulfilling our goal to improve today for a better tomorrow requires us to be responsible stewards of the environment, dedicated to leaving a light footprint and preserving ecosystems for future generations.

One of the cornerstones of our sustainability strategy approach and codified in our Environmental Health & Safety (EH&S) Sustainability Principle, protecting our planet is a part of our legacy. Owned by a multi-generational family, we've been committed to environmental sustainability for generations. But this dedication to protecting our planet and our communities has never been more critical than it is today.

Our approach to environmental sustainability performance is based on developing and using emerging technologies and innovations to:

- Lighten our impact on the planet
- Minimize climate- and water-related risks
- Utilize resources responsibly across the product lifecycle with an emphasis on the use of ethical and sustainable practices



**ADVANCED
MATERIALS**

Leading in Innovative and Sustainable Material Solutions



Huber Advanced Material's
Solar Array Which Powers
Its Marblehead, Illinois,
Manufacturing Facility

Our global footprint

Huber Advanced Materials is a global leader in halogen-free fire retardants, smoke suppressants, thermal management solutions, specialty aluminum oxides and organic matting agents and carriers.

We deliver ideal application solutions to enhance the performance, appeal and processing of a broad range of industrial, agricultural and consumer products.

Our innovation, advanced technologies, unique expertise, unsurpassed customer focus and technical know-how give us the edge to keep meeting the dynamic needs of tomorrow.

For more information on our complete line of Kemgard® molybdate products or to order product samples, contact us today.

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