

## Your newsletter for non-halogen fire safety solutions No. 62 February 2016

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### Fire Safety Requirements in Surface Transportation

pinfa-na ([pinfa North America](http://www.pinfa-na.org)) is organising its fourth annual workshop, 26-27<sup>th</sup> April 2016, Montreal, Canada. The workshop will provide insights into trends in the surface transportation industry and the latest fire safety developments of materials and components for the automotive, bus and rail industries. Themes cover FR technologies, materials technologies, test methods, environment and regulatory aspects, advanced manufacturing. Confirmed speakers to date include representatives of Bombardier, Sabic IP, Polynt Composites, CCT Group and Alpha Owen-Corning, Composites Innovation Center and key R&D institutes.

*pinfa-na Fourth Annual Workshop Meeting Fire Safety Requirements in Surface Transportation, 26-27 April 2016 Montreal [www.pinfa-na.org](http://www.pinfa-na.org) Co-organised by The National Research Council of Canada (NRC), Centre de Développement des Composites du Québec (CDCQ), Prima Quebec Advanced Materials Research and Innovation Hub (PRIMA QC), Society for the Advancement of Material and Process Engineering (SAMPE).*



HUBER ENGINEERED MATERIALS

### Huber invests in mineral PIN FRs in Europe

On February 1, 2016, pinfa-na (pinfa North America) member company Huber Engineered Materials (HEM) acquired the Martinswerk mineral PIN flame retardant business from Albemarle Corporation. The transaction includes Martinwerk's production site in Bergheim, Germany, more than 470 staff and product lines including the PIN FRs Martinal® aluminium trihydrate and Magnifin® magnesium hydroxide. Huber has 34 years' experience in flame retardants and smoke suppressants and since 2010 has widened its offer with acquisition of Kemgard® (mineral PIN FRs) from Sherwin-Williams, speciality hydrates from Almatris and Safire® (N and P PIN FRs) from Floridienne Group/Catena Additives.

The Martinswerk acquisition strengthens Huber as a global business in fire safety. HEM (Huber Engineered Materials) offers speciality ingredients for industrial, paper and consumer applications, and is part of J. M. Huber Corporation, founded in 1883 and today one of the USA's largest family-owned businesses, with a portfolio of companies focused around engineered materials.

[Press release](#): "Huber officially acquires Martinswerk business from Albemarle Corporation", 1 February 2015 [www.hubermaterials.com](http://www.hubermaterials.com)



## Extension leads cause fatal fires

Fatal fires are repeatedly caused by electrical extension leads, according to "Firewatch" in US NFPA Journal last three issues. An extension lead powering a DVD player caused a fire which killed a householder and destroyed a house in Michigan because a bookcase placed on the lead caused it to overheat and ignite nearby combustible materials. Electrical arcing in an extension lead in which several appliances were plugged caused a fatal with 40 000 US\$ property loss fire in Missouri. An extension cord powering a heater caused a fatal fire in Texas, again when the overheating power lead ignited combustible materials nearby. In Michigan, another fatal fire was caused by an overheated extension lead into which a space heater was plugged, which ignited an upholstered chair and flammable items on the chair including diapers and a baby seat.

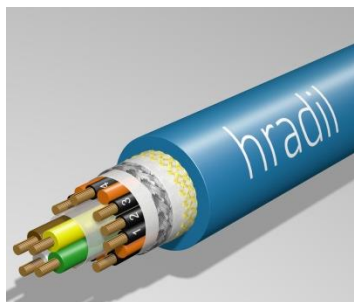
US National Fire Protection Association (NFPA) [www.nfpa.org](http://www.nfpa.org)



## Lanxess multi-application performance polyamide

Lanxess has launched a new PIN flame retardant glass-reinforced polyamide 6 for multi-performance class electrical switches and circuit breakers. The Durethan BKV 25 FN27 material provides the high mechanical strength and thermal stability necessary to withstand short-circuits (HDT heat distortion temperature 155°C under ISO 75-1-2), so can be used in high-current as well as low-voltage applications. This capacity for use in different voltage classes means economies for manufacturers, who can use the same material in different products, saving logistic and processing costs. The Durethan polyamide is also lower density than mineral-filled compounds, which also improves cost-effectiveness, shrinks isotropically (uniformly in all directions), can be coloured as required, and allows ultrasound welding for high weld strength. The PIN flame retarded material achieves UL94 V-2 at 0.75mm and the best possible GWFI (glow wire flammability index) under IEC 60695-2-11 (960°C, 1mm). First users of the material include the electrical supplies manufacturer Legrand.

[Lanxess press release](#): "Saving costs – one material for several performance classes", 13<sup>th</sup> October 2015 <http://press.lanxess.com>



## PIN FR low temperature CAN bus cable

Hradil Spezialkabel, specialist cables, has launched a new compact (reduced outside diameter), low-temperature resistant, drum-reeling CAN bus cable with high data throughput. The CAN (controller area network) protocol was developed by Bosch in 1983 and offers advantages of noise immunity, low cost and real-time capability. The cable offers impedance 120 ohms, tensile strength 2 000 N and resistance to fuels, cooling agents and lubricants. Noise-free video or data transmission is ensured even at low temperatures (down to -40°C and up to +80°C) and under mechanical stress and during movement. This makes the cable ideal for demanding applications such as controlling moving equipment in freezer storage areas. UV-resistance enables also outdoor applications. The Hradil CAN bus cable achieves ICE 60332-1 fire performance using PIN flame retardants and a non-halogenated TPE-U outer sheath.

*“Flexible CAN bus cable for chillingly hard work” Hradil Spezialkabel, [November 2015](#)*



## Optimal selection of PIN flame retardants

Online training course for compounders, materials suppliers and product manufacturers (E&E, B&C), looking at ensuring that fire resistant polymers can stay up-to-date with tightening market requirements, using low toxicity, high performance PIN fire retardant technologies. The course organisers state that new, innovative PIN flame retardants are continuing to come onto the market. Phosphorus, silicon and nanocomposite technologies will be specifically presented, covering both gas and solid phase modes of action. Aspects considered will include cost, plastics properties, loading levels, environmental impact, regulation, low smoke, low acidity, low toxicity and recycling.

*SpecialChem online formulation course “Halogen-free Flame Retardants: Optimal Selection for better performance” with Prof. Richard Hull (UCLan), 2<sup>nd</sup> March 2016 10h00 (New York time) = 16h00 (Paris time) <http://adhesives.specialchem.com/online-course/1118-Halogen-Free-Flame-Retardants-Selection>*



## “Bottoms in danger” say media

Electric bidets, including heating and power washing, are increasingly popular in Asia. Nearly 70% of Japanese households are equipped and sales growth in China is 20-30% per year. However, a China government investigation of 45 companies shows that 40% of products include inadequate or no flame retardants, leading to fire risks when overloaded. The bidets include features such as massage sprays, automatic deodorisation, electric flush and automatic opening and closing lids. Major fire incidents starting in bidets have been reported every year since 2012. Already in 2007, Japan’s leading toilet maker, recalled 180 000 ‘Toto Z’ bidets after several caught fire. The Japanese manufacturer INAX Corp also took action in 2009 after one of their toilet seats caught fire, warning against fire risks related to power surges or improper use.

*“Bidets may catch fire, Japanese toilet maker says”, USA Today [16/4/2007](#) “Japan in hot seat over risks of toilet fires” [3/2/2009](#) “Bottoms in Danger: 40% of Chinese Bidets Could Cause Burns”, Korea Bizwire [20/1/2016](#)*



## Alexium PIN FR successes

Alexium International's new innovative PIN flame retardant process for textiles uses organosilicon coatings, which combine inorganic and organic functionalities in one molecule for durable (wash resistant) fire safety treatment (see pinfa Newsletters 17 and 26). The process is adapted to nylon, wool, cotton and other fabrics. This year Alexium's Alexiflam™ has now moved to full scale production with orders from multiple major US bedding companies, producing fire safety treated mattress covers for the US retail market and applications in the home furnishing market. Alexium has been selected by Murdock Webbing to ensure fire safety for its range of straps and webbing in applications including: the building industry, health care, transportation and military strapping. Alexium has also been selected in stage two of the US Army Soldier Systems Center's Green Initiative project to develop a new flame retardant uniform fabric for the US Army (50/50 NYCO nylon/cotton). The company is also testing its product with a customer in the European automobile sector looking for environmentally-friendly solutions for fire safety for high quality textiles.

*"US Department of Defense (DoD) selects Alexium as Key Partner for New Fire Retadant Uniform Fabric", 26/10/2015*

*"Murdock Webbing Announces Alexium as New Provider of Flame Retardant (FR) Chemistry" 8/9/2015*

*"Alexium Receives Purchase Order for Scale Up Production Trial from New Client in European Transportation Sector", 1/6/2015*

*"First full large scale production order for Alexiflam™ chemistry received from major bedding customer" 14/9/15*

<http://alexiuminternational.com/products/flame-retardant-chemistries/>

*Photo: Alexiflam Finished Uniforms*



## Low-cost PIN enhanced fire performance cables

Teknor Apex, one of the world's leading custom plastics compounders, has launched two additional low-cost halogen-free flame retardant (HFFR) compounds, adapted for cabling used in subways, mass transit, cell phone emission towers, data centres, electronics and construction wiring applications. Halguard 58610 and 58615 (ISO 868 53 Shore D hardness) ensure UL94-V0 fire performance at 1.6 mm and pass UL-1685 FT-4 and UL-1666 riser flame tests for complex cables applications. Halguard 58620 (54 Shore D) provides low post-extrusion shrinkage, important for fibre optical applications and also passes UL-1685. The new compounds meet Teknor Apex's strategy of meeting the performance property requirements for general cable jacketing with PIN flame retardants.

*"Teknor Apex at Interwire: Showcases Newly Added Low-cost HFFR Compounds for Jacketing" 28/4/2015*

*See also pinfa Newsletters n°s52, 39, 37*



## Third Dubai skyscraper fire since 2012

The fire which severely damaged 'The Address' 63-storey skyscraper hotel Dubai (93<sup>rd</sup> tallest building in the world) on New Year's Eve is the third major skyscraper fire in the city since 2012, after the (aptly named) 'The Torch' fire (86 stories) in February 2015 and 'Tamweel Tower' in November 2012. The fire renews concerns about the use of non fire safety treated, combustible materials in exterior facades throughout the UAE. 16 people were injured in this fire but safety experts fear that "there will be fatalities sooner or later". Many buildings in the Emirates have non flame retardant, flammable, polyurethane and aluminium composite claddings because fire safety requirements were only introduced in 2013, when the UAE updated its Fire and Life Safety Code to require that exterior cladding is fire-resistant on all new buildings over 15 meters tall. Fire experts say "Hundreds of Dubai's tallest buildings are infernos waiting to happen" but the costs of replacing cladding on the many skyscrapers with pre-2013 fire danger materials will be tens of millions of dollars each.

"Dubai hotel fire: Inferno at 63-storey Address Downtown hotel near New Year's Eve fireworks display, Telegraph, [2/1/2016](#)

"Dubai Marina Torch Fire: What Next? Who Pays? Non-fire retardant cladding poses an enormous risk for high-rises in the UAE", Gulf Business [3/3/2015](#)



## Low loading P FR for epoxy resin

A novel phenophosphazine based PIN flame retardant (HD-PPA, a ten carbon ring molecule containing four nitrogen and two phosphorus atoms, 7.4% P) was experimentally synthesised and tested in DGEBA epoxy resins. HD-PPA was produced in a one-step reaction from PPA (see previous paper cited), 5,10-dihydro-phenophosphazine-10-oxide, which was produced in two steps by reacting diphenylamine with a phosphorus-carrier then with caustic soda. The HD-PPA reacts into the epoxy resin during curing. Zero to 3.5% loadings of HD-PPA were tested in epoxy resin, achieving UL94-V0 from 2.5% HD-PPA. Flaming dripping was prevented with 1% HD-PPA. 3.5% HD-PPA increased LOI of the epoxy resin from 24 (zero HD-PPA) to 32. The authors suggest that the HD-PPA functions by accumulating polyphosphate on the resin surface and promoting dehydration and esterification of the epoxy resin under fire conditions, so generating a char barrier. The HD-PPA addition at these levels improved the mechanical properties of the epoxy resin polymer.

"Intumescent flame retardancy of a DGEBA epoxy resin based on 5,10-dihydro-phenophosphazine-10-oxide", Q. Luo et al, RSC Advances, 2015, 5, 68476-68484 <https://dx.doi.org/10.1039/c5ra11847f>

"High performance fire-retarded epoxy imparted by a novel phenophosphazine-containing antifracking compound at ultra-low loading", Q. Luo et al., Materials Letters 169, 2016, 103-106 <http://dx.doi.org/10.1016/j.matlet.2016.01.083>



## General Plastics aircraft rigid PUR foam

Last-a-Foam® FR-3800 is General Plastics' new PIN flame retardant rigid polyurethane foam compliant with fire-safety, smoke toxicity and corrosivity requirements for aircraft interiors. This is the first non-halogenated polyurethane foam to meet the FAA Federal Aviation Authority FST (Flammability, Smoke and Toxicity) standard and the OSU Ohio State University 65/65 heat release standard. General Plastics offers custom moulded parts production to improve aircraft interior functionalities and aesthetics. General Plastics operate their own sampling and testing facilities, to guarantee both fire safety performance and foam characteristics. Last-a-Foam rigid, PIN flame retarded, polyurethane based foam is available in 3 to 40 pounds per cubic foot (48 – 640 kg/m<sup>3</sup>) densities. The foam is self-extinguishing and self-skinning, suitable for a variety of aircraft interior applications including in sandwich and composite panels, edges and corners, seals, rest pads and flight deck components. The foam offers significant weight advantages compared to metallic parts, and price and application advantages compared to honeycomb composite core materials, with ease of bonding, possibility to produce complex shapes, closed cell and isotropic structure

*26<sup>th</sup> October 2015 "General Plastics to Highlight FR-3800 FST Aerospace Foam Core Series at Aircraft Interiors Expo Americas, Nov 4-5, 2015. Leading high-density polyurethane foam supplier also featuring its FAA-certified testing and build-to-print capabilities", [www.generalplastics.com](http://www.generalplastics.com)*

*[Blog](#) "Taking Flight: The Next Generation of Composite Core Material for Aircraft Interiors"*



## Developments in intumescent coatings for steel

PIN-FR based intumescent coatings have been used to protect materials from fire since Gay-Lussac proposed ammonium polyphosphate based systems for textiles in 1821. In 2012 the world intumescent coatings market was just over 700 million US\$ and is expected to rise to over 900 million US\$ by 2018. Intumescent coatings, with dry thicknesses after application of 1-30 mm can protect steel structures in fire for up to 2 hours, that is prevent the steel reaching 550°C, the temperature at which it loses its structural strength. Intumescent coatings combine a carbon source (to generate fire-resistant char), an acid source/catalyst to ensure reaction, a blowing agent/spumific to increase volume and binding agents, often with a first undercoat on the steel to ensure adhesion and corrosion protection. Developments include low or no-solvent application, acrylic resin and epoxy resin binders, expandable graphite, synergist additives, new phosphorus based components, mineral and fibrous fillers, glass flakes and nanocomposites. These will help address the challenges of developing products with improved fire resistance, positive environmental and safety profiles and cost effectiveness of both product and application.

*"Recent developments of intumescent fire protection coatings for structural steel: A review", T. Mariappan, Journal of Fire Science, 1-44, 2016*  
<http://dx.doi.org/10.1177/0734904115626720>



## PIN FR market expects continuing growth

An analysis and opportunity assessment of the global PIN flame retardant market 2015-2025 (published January 2016) predicts annual market growth of 6.4% CAGR. The report looks at metal oxides, phosphorus, nitrogen and other PIN flame retardants, in building and construction, electrical and electronics, automobile and other sectors, specifically in plastics (covering 7 key polymers), rubber and textiles and over 6 world regions. PIN flame retardants are identified as more environmentally friendly.

*“Non-Halogenated Flame Retardants Market: Global Industry Analysis and Opportunity Assessment 2015 – 2025”, Jan 2016, Future Market Insight Global & Consulting, 205 pages <https://www.reportbuyer.com/product/3599942/non-halogenated-flame-retardants-market-global-industry-analysis-and-opportunity-assessment-2015-2025.html>*



## FireBar Concept

The National Graduate School of Engineering Chemistry of Lille (École Nationale Supérieure de Chimie de Lille, ENSCL) has won a European Research Council Advanced Grant of 2.4 million € for the ‘FireBar Concept’ research project, to develop new materials and composites with low flammability to limit propagation and development of fires. The aim is to develop fire barriers which will react intelligently to heat. The project launch will take place 3<sup>rd</sup> March 14h00 at Polytech Lille in presence of the regional Prefect and the President of the Regional Council.

ENSC [FireBar](#) ERC grant



## Other News

**HBCD temporary phase-out exemption:** The EU Commission has officially published the decision (see pinfa Newsletter 57) to authorise 13 companies to continue to use the brominated flame retardant HBCDD (hexabromocyclododecane) in expanded polystyrene in building applications until August 2017, subject to the requirement to submit reports every three months on progress towards substituting the substance. HBCDD is listed by the Stockholm Convention on Persistent Organic Pollutants (POPs) with an exception for construction applications.

ECHA/NI/16/03. *“The European Commission grants authorisations for two uses of hexabromocyclododecane (HBCDD)”* [20/1/2016](#)

**Biodegradation of flame retardants:** a review paper, based on the work of the ENFIRO project (see pinfa Newsletter n°36) summarises current knowledge of FR biodegradation. This paper considers that some legacy BFRs used in the past may pose persistency issues or may partly decompose to possibly toxic compounds. Information regarding degradation of both alternative BFRs and organophosphorus FRs is considered inadequate. However, organophosphorus FRs are generally considered by the authors to be *“more susceptible than BFRs to biodegradation due to their hydrolysable phosphorus ether bonds”*.

*“Biodegradation of brominated and organophosphorus flame retardants”, S. Waaijers & J. Parsons, Curr Op in Biotechnology 2016, [38, 14-23](#)*

## Upcoming pinfa events:

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26-27 April	Montreal, Canada	▶	pinfa-na industry seminar: flame retardancy of materials for surface transportation <a href="http://pinfa-na.org">http://pinfa-na.org</a>
15 June	Brussels	▶	pinfa General Assembly

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For complete, up to date events listing, see [www.pinfa.eu](http://www.pinfa.eu)

## Publisher information:

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For abbreviations see: [www.pinfa.org](http://www.pinfa.org)