

## Events

Ten years of collaboration for safer fire safety  
Pinfa E-Mobility Workshop, Tokyo, 1st July 2019  
FRPM19  
Chemicals management for the electronics industry

## Regulatory and policy

ECHA publishes CoRAP to 2021  
Swedish Eco-tax under discussion  
ChemSec again criticises Swedish E&E ecotax  
EU POPs legislation will restrict DecaBDE  
Alaska city bans certain FRs in furniture  
Canada proposes DBDPE ban

## Product innovation and applications

Flame retardant cable and resins markets developing

1

1

1

2

2

3

3

4

4

4

5

5

6

6

New product enables PIN FR textile back coatings  
FRX Polymer on Global Cleantech 100 List  
Polyphosphonate FRs for high-temperature PUR foam  
Performance PIN FR polyamide for electromobility  
HFR Insulating Metal Panels  
MilesTek LSZH cables for demanding applications  
PIN FR ruggedized railway data cables

6

7

7

7

8

8

8

## Media and dialogue

8

Notre Dame de Paris  
Why aviation fire testing is important  
Most expensive barbecue ever?

8

9

9

## 4th Spanish Fire Retardant Plastics Conference

10

Research towards tomorrow's PIN fire safety  
Industrial applications: recycling, 3D-printing, XEV

10

12

## EVENTS



### Ten years of collaboration for safer fire safety

pinfa celebrated ten years of working together towards sustainable fire safety at an exceptional General Assembly, organised in Valencia with the 4<sup>th</sup> AIMPLAS [workshop](#) on fire-retardant plastics (see below). pinfa has grown from 6 founding members ten years ago to over 30 today. After pinfa was launched ten years ago in Europe, the momentum has spread to North America in 2012, and extended further in 2018, with the launch of pinfa China. The strong engagement of the flame retardant value chain reflects the thriving growth of PIN fire safety applications. This echoes both a global tendency to tighten fire safety requirements and a continuing movement towards non-halogenated solutions. In its first ten years, pinfa has actively reached out to stakeholders, has engaged in collaborative projects on recycling, chemical taxation, smoke toxicity, standards and fire safety research. Discussion showed that members particularly value pinfa's commitment to trust, reputation, transparency and teamwork, as well as pinfa's achievements in education and networking. From this strong base, pinfa is now beginning the next ten years.

Short video: <https://www.linkedin.com/feed/update/urn:li:activity:6521318711574425600>

Press release "pinfa turns 10, a decade of cooperation towards safer and more environmentally compatible fire protection" [www.pinfa.eu](http://www.pinfa.eu)

### Pinfa E-Mobility Workshop, Tokyo, 1st July 2019

The pinfa Japan workshop "Fire Safety Challenges in Automotive Plastics", Tokyo, 1<sup>st</sup> July, will take place within [EMCE2019](#) (E-Mobility and the Circular Economy). The workshop will address fire safety challenges facing the automobile industry with electric and hybrid vehicles, such as compliance with standards and requirements of materials, choice of flame retardants and compliance with fire safety regulations. The workshop will enable discussion of how non-halogenated flame retardant solutions (PIN Phosphorus, Inorganic and Nitrogen) can support the Japanese emobility market. Presentations will include pinfa members Adeka, Clariant and Dupont, alongside automotive manufacturers and materials experts.

pinfa eMobility workshop, Tokyo 1<sup>st</sup> July 2019, 14h-19h, within EMCE2019 simultaneous translation English/Japanese, <https://www.icm.ch/emce-2019> Registration [info@icm.ch](mailto:info@icm.ch)



# FRPM<sup>19</sup>

EUROPEAN MEETING ON  
FIRE RETARDANT POLYMERIC MATERIALS  
26.-28.6.2019 TURKU FINLAND

## FRPM19

The 19<sup>th</sup> edition of the biennial European Meeting on Fire Retardant Polymeric Materials ([FRPM19](http://frpm19.com/)) will take place 25-28 June, Turku, Finland. The conference will include a visit to the Meyer shipyard to visit the world's largest cruise ship, under construction. FRPM19 will include 60 presentations and over 100 posters. The full programme is now online and covers optimizing flame retardant formulations, new phosphorus chemistries, FRs for industrial applications, fireproof coatings, FRs for timber, bio-derived FRs, composites, chemical safety, legislation, combustion science and fire chemistry.

FRPM19 <http://frpm19.com/>



## Chemicals management for the electronics industry

The ChemicalWatch conference on [chemicals management](#) in the electronics industry, Brussels, 28<sup>th</sup> March, showed that ensuring greener chemicals in plastics is a major challenge for the electronics industry, with some stakeholders even asking whether difficulties in controlling chemical safety and in electronic displays ensuring safe recycling could lead to question current use of plastics in E&E. The conference included contributions from the European Commission, OEMs, verification organisations and researchers. Discussions covered legislation driving safer chemicals requirements (WEEE, RoHS, REACH, POPs ...) but also standards, voluntary schemes such as ecolabels and industry materials lists. The [proposed](#) EcoDesign Directive restriction on brominated flame retardants in electronic displays was particularly discussed, with some OEMs open to this because they are already moving to non-halogenated fire safety solutions, but industry concern that this is not the appropriate regulatory channel for substance restrictions. The importance of information sources for industry wishing to identify safer substitute chemicals was underlined, such as the IEC 62474 [database](#) on material declaration, the [pinfa product selector](#), TCO certified [accepted substances list](#), the [Chemsec MarketPlace](#) (see pinfa Newsletter n°97) and [MaterialWise](#) (a repository of hazard assessments of chemical alternatives, verified by external experts).

ChemicalWatch events page <https://events.chemicalwatch.com/73247/chemicals-management-for-the-electronics-industry>

Full summary of the conference "Chemicals management for the electronics industry", ChemicalWatch, Brussels, 28<sup>th</sup> March 2019 <https://www.linkedin.com/pulse/long-thorny-way-greener-electronics-chemicals-management-beard>

To learn more about "Design for Fire Safety in Greener Electronics": pinfa workshop on April 30 and May 1, 2019, San Jose, California, USA [technical program](#) and general information <http://www.pinfa-na.org/>

## REGULATORY AND POLICY



### ECHA publishes CoRAP to 2021

The European Chemicals Agency, ECHA, has published the Community Rolling Action Plan (CoRAP) 2019-2021, listing chemicals for Evaluation (under REACH) during this period. 21 additional chemicals are added, none of which are flame retardants, and 11 are withdrawn (no longer used or further information concluding low priority). In total, the CoRAP Evaluation [list](#) now contains 376 chemicals, including the following flame retardants:

Flame retardants on ECHA CORaP list for evaluation, as at March 2019			
<u>Halogenated flame retardants and their synergists</u>		EINECS #	Evaluation status
Diantimony trioxide		215-175-0	Ongoing
1,1'-(ethane-1,2-diyl)bis[pentabromobenzene]	EBP	284-366-9	Information requested
1,1'-(isopropylidene)bis[3,5-dibromo-4-(2,3-dibromo-2-methylpropoxy)benzene]		306-832-3	Ongoing
1,1'-(isopropylidene)bis[3,5-dibromo-4-(2,3-dibromopropoxy)benzene]	FR720	244-617-5	Ongoing
2,2',6,6'-Tetrabromo-4,4'-isopropylidenediphenol, oligomeric reaction products with Propylene oxide and n-butyl glycidyl ether		926-564-6	Information requested
2,2,6,6-tetrabromo-4,4-isopropylidenediphenol	TBBPA	201-236-9	Information requested
2,2-dimethylpropan-1-ol, tribromo derivative	TBNPA	253-057-0	Not started
2,4,6-tribromophenol	TBrP	204-278-6	Concluded
Bis(2-ethylhexyl) tetrabromophthalate	TBPH	247-426-5	Ongoing
N,N'-ethylenebis(3,4,5,6-tetrabromophthalimide)	EBTBP	251-118-6	Ongoing
Alkanes, C14-17, chloro (Medium chained chlorinated paraffins)	MCCP	287-477-0	Information requested
Reaction mass of tris(2-chloropropyl) phosphate and tris(2-chloro-1-methylethyl) phosphate and Phosphoric acid, bis(2-chloro-1-methylethyl) 2-chloropropyl ester and Phosphoric acid, 2-chloro-1-methylethyl bis(2-chloropropyl) ester	TCP	911-815-4 (237-158-7)	Not started
Tris[2-chloro-1-(chloromethyl)ethyl] phosphate	TDCP	237-159-2	Not started
<u>Phosphate esters</u>			
Tetraphenyl m-phenylene bis(phosphate)	RDP	260-830-6	Not started
Tributyl phosphate	TBP	204-800-2	Concluded
Triphenyl phosphate	TPP	204-112-2	Information requested
Triphenyl phosphite		202-908-4	Follow-up
Tris(methylphenyl) phosphate		809-930-9	Information requested
Trixylyl phosphate	TXP	246-677-8	Information requested

ECHA CoRAP List update 19<sup>th</sup> March 2019 <https://echa.europa.eu/-/member-states-will-evaluate-31-substances-in-2019> and full CoRAP list of 376 substances subject to Evaluation <https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table>



**Regeringskansliet**

## Swedish Eco-tax under discussion

The Swedish Government is consulting for a possible revision of the national Ecotax on electrical equipment, [introduced](#) in 2017 (Lag 2016:1067) and [modified](#) already in 2019. An important issue for government is that the tax is not bringing in significant revenue (less than 200 million €, below half the intended tax income, compared to high administrative costs). Furthermore, internet sales escape from such a national tax, and it is indicated that these already represent a quarter of the market and are growing. The electronics industry federation estimates that this will lead to a loss of 800 – 2 000 jobs in Swedish retail. Even KEMI, the Swedish chemical authority, states that the tax needs to be evaluated. Stakeholders (see pinfa Newsletter n°81) have criticised the ecotax, including environmental NGO ChemSec (pinfa Newsletter n°86) who consider that the tax is badly targeted because it covers not only halogenated but also some PIN flame retardants (see below). With other industry stakeholders, pinfa is preparing a position to the Swedish Government underlining that the ecotax at present fails to distinguish flame retardants according to their environmental and health profile, and taxes products with no flame retardants and poses many unclear questions for implementation because of complexity or inaccuracies in annexes. This position suggests that in addition to the current 50% tax reduction for products not containing halogenated flame retardants, a 100% tax exemption should apply where recognised safer flame retardants are used.



## ChemSec again criticises Swedish E&E ecotax

Environmental NGO ChemSec has again taken position criticising the Swedish ecotax on electrical and electronic equipment as currently defined. Already in 2017 (see pinfa Newsletter n°86), ChemSec indicated that the tax currently covers certain PIN FRs which are “some of the preferred alternatives to halogenated flame retardants”. In response to the Swedish Governments proposal to increase the ecotax (probably mainly because it is not bringing in the revenue expected, and is difficult to implement), ChemSec again states “several of the safer alternatives that many electronics companies use as replacements for bromine- and chlorine- based flame retardants ...safer for health and the environment are also taxed”. ChemSec states that phosphorus based FRs should be assessed individually, because their properties are widely variable, and notes that “Since the tax on electronics was introduced it has been found that the information that originally formed the basis for including the entire group of phosphorus-based flame retardants was inadequate.”

*ChemSec letter on the proposal Sweden Government's proposal “to raise tax on chemicals in some electronic goods”, Fi2019/00431/S2, 6<sup>th</sup> March 2019*

[https://chemsec.org/app/uploads/2019/03/ChemSec-Remissvar-190306\\_EN.pdf](https://chemsec.org/app/uploads/2019/03/ChemSec-Remissvar-190306_EN.pdf)



## EU POPs legislation will restrict DecaBDE

EU legislators (Parliament and Council) have agreed modifications to the POPs Regulation (Persistent Organic Pollutants, [EC 850/2004](#)) to implement updates of the UN Stockholm Convention (see pinfa Newsletter n°81), in particular adding the brominated flame retardant DecaBDE to the POPs Regulation, with an “unintentional trace” level of 10 ppm. The combined level of all PBDE flame retardants is set at 500 ppm, with a review clause requiring an assessment of the environmental and health impact of this level. Some exemptions are specified for aircraft, motor vehicles

and electronic equipment. These levels represent a compromise between demanding safety limits, and feasibility of recycling of plastics, because secondary plastics may contain traces of these substances because sorting of waste plastics containing brominated flame retardants is never 100% exact. However, the debate over brominated flame retardant contamination in recycled plastics is not over, and environmental NGOs worldwide have written to the Stockholm Convention requesting that the EU withdraw its recycling exemptions for the brominated FRs TetraBDE, PentaBDE, HexaBDE and HeptaBDE.

*European Council press release 19/2/2019 "Persistent organic pollutants: Provisional agreement on the world's most dangerous pollutants"*

<https://www.consilium.europa.eu/fr/press/press-releases/2019/02/19/persistent-organic-pollutants-provisional-agreement-on-the-world-s-most-dangerous-pollutants/>

*"Withdrawing the Stockholm Convention recycling exemptions for TetraBDE, PentaBDE, HexaBDE and HeptaBDE", environmental NGOs letter (Amika, CIEL, EEB, HEAL, IPEN ...), 23 April 2019 <https://ipen.org/news/immediate-action-withdraw-exemption> and [https://ipen.org/sites/default/files/documents/ngo\\_letter\\_eu\\_pbde\\_recycling\\_exemption\\_23042019.pdf](https://ipen.org/sites/default/files/documents/ngo_letter_eu_pbde_recycling_exemption_23042019.pdf)*



## Alaska city bans certain FRs in furniture

The City of Anchorage, Alaska's biggest city with 300 000 population, has passed an ordinance banning many types of flame retardant in (consumer) upholstered furniture and products for children under 12 (for use in the home). All "halogenated, organophosphorus, organonitrogen or nanoscale" flame retardants are covered by the ban, as well as antimony and also any FR listed by Washington or California. Halogenated is defined as covering any flame retardant containing fluorine, chlorine, bromine or iodine. The ban covers manufacture, sale or distribution or any other transaction, within the municipality. Such local bans pose difficult problems for retailers and manufacturers operating at anything other than a local level.

*Anchorage municipal ordinance AO 2019-15(S), voted on 19<sup>th</sup> March 2019*

[http://www.muni.org/Departments/Assembly/Documents/AO%202019-15\(S\)\\_1\\_As%20Amended.pdf](http://www.muni.org/Departments/Assembly/Documents/AO%202019-15(S)_1_As%20Amended.pdf)



## Canada proposes DBDPE ban

The Canada Government (Health Canada) has proposed a ban on the manufacture, sale or import of the brominated flame retardant DBDPE (decabromodiphenyl ethane), which is used as an alternative for DecaBDE (decabromodiphenyl ether). This follows a screening assessment (2016) and a consultation on a ban (60 days from 21<sup>st</sup> December 2018). The Health Canada website states that DBDPE "may remain in the environment for a long time ... transforms to products that are similar to lower brominated polybrominated diphenyl ethers (PBDEs) ... found to accumulate in some organisms, remain in the environment for a long time, and may cause harm to some organisms."

*Health Canada Decabromodiphenyl ethane (DBDPE) - Benzene, 1,1'-(1,2-ethanediyl)bis[2,3,4,5,6-pentabromo- CAS 84852-53-9, updated 4<sup>th</sup> February 2019*

<https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/chemicals-glance/decabromodiphenyl-ethane.html>

## PRODUCT INNOVATION AND APPLICATIONS



### Flame retardant cable and resins markets developing

A market study estimates that the world market for fire resistant cables will increase from 1.7 to 2.12 billion US\$ 2017 to 2024, with a growth rate of more than 3% per year. Drivers are identified as urbanisation and increasing fire safety and security awareness. Building and construction is the largest user sector, with increasing demand also in automotive and transportation, as well as energy, manufacturing and other sectors. A second market study suggests that flame retardant resins for the composites industry will grow to 5.8 billion US\$ by 2024. Around a quarter of composite resins (thermoset and thermoplastic) are flame retardant. Drivers for growth are identified as ongoing growth in key user industries (aerospace, defence, railways, electronics – especially printed circuit boards in electronics.), growing penetration of composites and introduction of more stringent fire safety regulations.

*Zion Market Research, 5/12/2018 "Fire Resistant Cable Market by Insulation Material (XLPE, PVC, LSZH, EPR, and Others) and by End-Use Industry (Building & Construction, Automotive & Transportation, Manufacturing, Energy, and Others): Global Industry Perspective, Comprehensive Analysis, and Forecast, 2017–2024"*

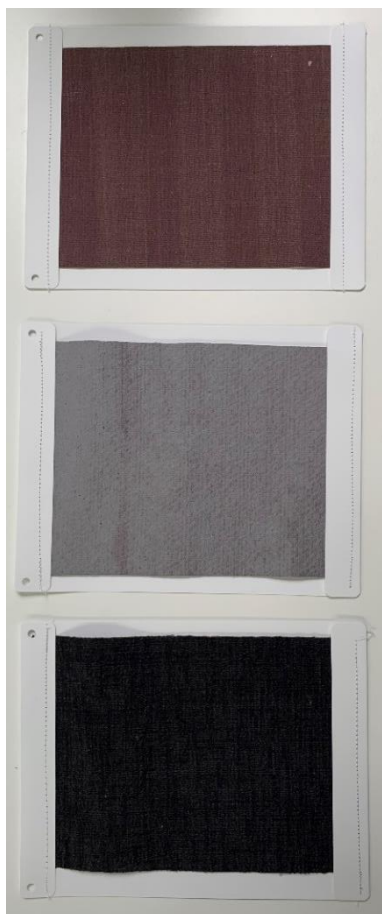
<https://www.zionmarketresearch.com/report/fire-resistant-cable-market>

*Stratview Research "Flame-Retardant Resin Market in the Composites Industry to Reach US\$ 5.8 Billion in 2024", 22<sup>nd</sup> January 2019 , <https://www.prnewswire.com/news-releases/flame-retardant-resin-market-in-the-composites-industry-to-reach-us-5-8-billion-in-2024-says-stratview-research-808528101.html>*

### New product enables PIN FR textile back coatings

CTF2000 is a Belgian company of the [FLAMAWAY Group](#), with production sites and offices in Belgium, UK, Germany & China, specialised in flame retardant chemicals and textile specialties. They have developed a new "economical" PIN flame retardant coating product which will enable substitution of halogenated back coatings in applications such as domestic and public furniture, blackout curtains, technical textiles, automotive, construction and furnishings. Several patents are pending. It is applicable to both natural and synthetic fibres (e.g. polyesters, polyamides, acrylics), whereas current non-halogenated solutions are generally used only on natural fibres. This new product is based on red phosphorus with nitrogen and mineral PINs, using an innovative micro-encapsulation which ensures high performance, processability, washing durability and near-zero migration. Wash durability can be obtained up to 40 cycles at 40°C and beyond, enabling use in furniture cushion covers and similar. The innovative encapsulation ensures that the coating emits no detectable phosphine and no smell (challenges with red phosphorus). The PIN synergies ensure higher fire safety efficiency for a "lower" red phosphorus loading. The new product, with a back coating of around 70 g/m<sup>2</sup>(dry), can enable textiles to achieve demanding fire safety standards as required by the UK Furniture Fire Safety Regulations. Formulations are also available for other regulations for furniture or blackout curtains in public places (e.g. BS5852, BS5867, EN 13773, DIN 4102, NFP 92-503, DIN 41-02, NFPA 701, ...). The product offers good feel and handling properties. It is available in black, reddish or grey. As the product is non-halogenated and has a positive safety profile, it has been approved on the OEKO-TEX® ACP list (active chemicals products).

[WWW.CTF2000.COM](http://WWW.CTF2000.COM)





## FRX Polymer on Global Cleantech 100 List

Pinfa member company, FRX Polymers, a global leader in polymeric non-halogenated PIN flame retardants, has been named to the 2019 Global Cleantech 100 List for the sixth time in ten years. This list recognises sustainable innovation. The List addresses independent companies not listed on a major stock exchange. This year, nearly 14 000 companies were nominated from 93 countries. FRX Polymers listing recognises its work in developing markets for its breakthrough polymeric phosphorus based PIN flame retardant, which offers fire safety with a good health and environmental profile, and near zero emissions.

FRX press release 28 February 2018 <https://www.frxpolymers.com/news-events-2/2019/3/4/frx-polymers-earns-spot-on-2019-global-cleantech-100-list-of-top-companies-in-sustainable-innovation>

Global Cleantech 100 list <https://www.cleantech.com/release/top-private-companies-in-clean-technology-named/>



## Polyphosphonate FRs for high-temperature PUR foam

FRX Polymers (a pinfa member company) has launched an innovative new grade of non-halogenated oligomeric PIN flame retardants for high temperature polyurethane flexible foams. The new grade of polyphosphonates can achieve UL94-V0 fire performance combined with high temperature resistance and dimensional stability as demanded in transport and electronics applications. Mechanical performance is maintained after ageing at 150°C enabling use in demanding applications such as motor compartment vehicle parts or noise/vibration foams, electric battery packs and electromobility electronics. The polyphosphonates are available in both powder and liquid formulation, so improving processing efficiency, and were developed to respond to automotive industry needs for a replacement for expandable graphite in one-step foam processes for engine compartments.

*"FRX Polymers® Announces Availability of Nofa® Non-Halogenated Flame Retardants for UL94-V0 High-Temperature PUR Foam", 24 October 2018*  
<https://www.frxpolymers.com/news-media-center#news>



## Performance PIN FR polyamide for electromobility

Solvay (a pinfa member company) has launched new advanced polyamide-based (PA66) materials for the demanding performance and specific fire safety needs of electric vehicles. Nitrogen and inorganics based PIN flame retardants enable to achieve fire safety requirements, whilst avoiding risks of galvanic corrosion which is susceptible to lead to systems failure or short-circuiting. The formulations offer high temperature dimensional stability, heat and glycol resistance and are available in bio-sourced grades. Applications include hydrogen manifolds, fuel cells, sensors, heater plates, high power electric vehicle charges and connectors.

*"New Technyl® advanced materials for electrical connectivity applications in e-mobility", Solvay 16 October 2018*  
<https://www.technyl.com/en/press/press-releases/2018-10-25-new-technyl-advanced-materials-for-electrical-connectivity-applications-in-e-mobility.html>

#### Kingspan Announces New HFR-Free-Cored Insulated Panel



Deland, FL - Kingspan, an industry leader in the design, development and delivery of advanced building envelopes, selected Greenbuild 2015 as the perfect venue to announce what it calls "the most significant



Announcing Formawall with Halogen-Free Foam

Voluntary product enhancement sets the standard in sustainable insulated metal panel innovation.

Moon Township, Pa., Feb. 2, 2018 - CENTRIA, a leader in architectural metal wall systems, is proud to announce a groundbreaking sustainability enhancement to its industry-leading Formawall line of insulated metal panels (IMPs) with the elimination of halogens from the product's insulating foam core. The latest evolution of Formawall enables the

## HFR Insulating Metal Panels

Several manufacturers now offer Halogen Free Flame Retardant insulated cladding (IMP = Insulated Metal Panels) in the US according to Building Green. Kingspan first [introduced](#) non Halogen Flame Retardant (HFR-free) IMPs in 2013, and is now making them available mass produced. Centria launched HFR-free Formawall [panels](#) in late 2017 and has made non-halogenated their standard product.

*"Announcing Formawall with Halogen-Free Foam", 2 February 2018*

<https://www.centria.com/news/2018/02/centria-launches-formawall-with-halogen-free-foam>

*"CENTRIA Announces Formawall Insulated Metal Panels With Halogen-Free Foam"*

<https://designandbuildwithmetal.com/industry-news/2018/02/06/centria-announces-formawall-insulated-metal-panels-with-halogen-free-foam> - and Kingspan panels

[https://az750602.vo.msecnd.net/netxstoreviews/assetOriginal/79932\\_Kingspan\\_Blue\\_Book\\_N\\_A.pdf](https://az750602.vo.msecnd.net/netxstoreviews/assetOriginal/79932_Kingspan_Blue_Book_N_A.pdf)



## MilesTek LSZH cables for demanding applications

Specialised in manufacture of products for military, aviation, broadcast and telecom industries since 1981, MilesTek is part of the Infinite Electronics group, offering electronic components and technical support. MilesTek has launched a range of LSZH (Low Smoke Zero Halogen) PIN FR cables including D-subminiature video, USB 3.0 and mains leads. These are adapted to confined spaces, military and aviation specifications, and other applications where protecting people and equipment from toxic smoke and corrosive gases is important.

*"MilesTek Debuts Low-Smoke Zero-Halogen DSub Cable Assemblies for Military Applications", 19 October 2017, "MilesTek Launches New Line of Power Cords with Low-Smoke Zero-Halogen Jackets", 8 March 2018, "MilesTek's New USB 2.0 Cables Combine*

*LSZH Jackets with Latching Connectors", 8 May 2018* <http://www.milestek.com>



## PIN FR ruggedized railway data cables

TE Connectivity, a global communications electronics supplier with 7 000 engineers worldwide, has launched a Category 5e quad high speed data cable for railway rolling stock and infrastructure applications, compliant to EN45545-2. The cable uses non-halogenated, low smoke, flame retardant plastic insulation and a crosslinking outer jacket to achieve high resistance to chemicals, fuels and oils, mechanical stress and temperatures. The cable is R15/R16 - Hazard level 3, ANSI/TIA-568-C.2 and DIN 5510-2. TE-Connectivity now offers the full range of Cat5e, Cat6 and Cat7 railway cables PIN flame retarded to ensure compliance to EN45545-2.

*"TE Connectivity launches ruggedized data cable", 2<sup>nd</sup> May 2018*

<https://www.railwaygazette.com/news/technology/single-view/view/te-connectivity-launches-ruggedised-data-cable.html> and [https://www.dalroad.com/wp-content/uploads/2018/04/ENG\\_DS\\_1-1773947-8\\_Cat5e\\_Rail\\_Data\\_Cable\\_0318.pdf](https://www.dalroad.com/wp-content/uploads/2018/04/ENG_DS_1-1773947-8_Cat5e_Rail_Data_Cable_0318.pdf)

## MEDIA AND DIALOGUE

### Notre Dame de Paris

On 15<sup>th</sup> April, The fire which partly destroyed the Notre Dame Cathedral, Paris, a symbol of the French nation, was watched live by the nation at peak television news time. The cause of the fire remains under investigation, but it started in the complex "forest" of roof rafters where renovation work was underway. The bravery,



competence and appropriate response of fire fighters prevented complete collapse of the building, maybe by only a few minutes. Guillermo Rein, Imperial College London, on BBC Science, 18<sup>th</sup> April, 21h00, explained that the mixture of thin and thick wood made the worst scenario for fire, combining easy to ignite with long-burning and hard to extinguish. He indicates that the only fire protection in place ("one layer") was to avoid introducing an ignition source. He noted that cold water on hot stone can cause collapse, so making the firefighters intervention very complex. Fire can irreversibly damage stone, steel, brick and concrete, and knowledge is very lacking in these areas. France has announced an international architectural competition to replace the Cathedral's spire, which the world saw fall into the fire, either identical or with a modern new design. The destroyed spire was built in 1880 (on an 1852 design) by Violet Le Duc, France's "notorious" gothic heritage restorer.

## Why aviation fire testing is important

Beth Dean, in IFP Magazine, summarises the history of aviation fire safety, key fire tests used today and perspectives for the future. Materials fire testing in aviation was introduced from the 1940's but was limited to vertical flame spread. Requirements were considerably tightened from the 1980's, after an inflight fire in 1983 (Canada, DC-9) in which half of the 46 passengers died. Today's aircraft materials fire tests include Bunsen burner self-extinguishing and flaming droplets requirements, 60 minute test for cables, kerosene test for some larger aircraft parts, heat release rate and smoke development. There have been 3 000 fires in aviation over the last ten years, with only 10 fatalities. However, the author expects the ongoing increase in air travel and development of new generation aircraft will lead to pressure to continue to tighten fire safety requirements. Requirements may also be extended to smaller aircraft (<20 seats currently excluded). Smoke toxicity testing is today required by leading aircraft manufacturers, and harmonisation of toxicity testing requirements can be expected.

The dangers of fire in aircraft have been sadly shown by the Aeroflot plane fire at Moscow airport on 4<sup>th</sup> May this year, in which over 40 people died, apparently after the plane engines and fuel caught fire during an emergency landing.

*"Importance of material fire testing for the aviation industry", Beth Dean in IFP Magazine (International Fire Protection Magazine) 21 February 2019*

<https://ifpmag.mdmpublishing.com/importance-of-material-fire-testing-for-the-aviation-industry/>

BBC News "Russian plane crash: 41 killed on Aeroflot jet" 5<sup>th</sup> May 2019

<https://www.bbc.com/news/world-europe-48171392>

## Most expensive barbecue ever?

Two Italian students face a combined fine of 27 million Euros because their garden barbecue grilling meat accidentally started a wildfire on 30<sup>th</sup> December 2019. The fire lasted several days destroying over 1000 hectares of forest near Como, Italy. The fine was calculated according to regulations which require a fine of 100-600 € per square metre of damage. The 22 year olds may also face proceedings for damages by property owners impacted by the fire.

BBC news 17<sup>th</sup> April 2018 <https://www.bbc.com/news/world-europe-47960358>



### Importance of material fire testing for the aviation industry



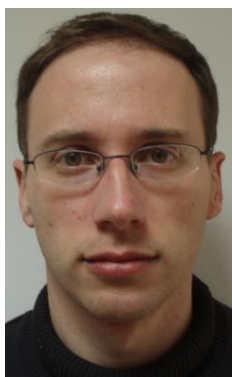
## 4<sup>TH</sup> SPANISH FIRE RETARDANT PLASTICS CONFERENCE



The fourth Fire Retardant Plastics Conference, organised by AIMPLAS with pinfa support in Valencia, Spain, 4<sup>th</sup> April, brought together seventy flame retardant producers, compounders, flame retardant users and retailers. **Luis Roca of AIMPLAS (the Spanish Plastics Technology Centre) and Adrian Beard, pinfa President**, opened the conference which presented both research and company product innovations in PIN flame retardants, with the theme “Recyclability, sustainability and future trends”.



### Research towards tomorrow's PIN fire safety



**Rodolphe Sonnier, C2MA Mines d'Alès, France**, outlined different possible routes for developing bio-based PIN flame retardants. Bio-based molecules can have a high oxygen/carbon ratio (so low energy release in fire), functional groups enabling grafting of flame retardant molecules, and an inherent capacity to generate char (carbon content). Examples cited include lignin or phenols, which can be functionalised with phosphorus, but a challenge is stability in processing. Studies have shown effectiveness of ground olive pomace (olive stone pressing waste) to replace pentaerythritol in intumescent, but black coloration is an obstacle. Phytic acid, naturally found in seeds and which has high phosphorus content, offers potential because it can be combined with different metal salts. The economics of bio-based FRs can be improved if they also have another function in the plastic, e.g. as a plasticiser.

See also the book “Towards bio-based flame retardant polymers” (Springer, 2018)  
<https://www.springer.com/us/book/9783319670829>



**Begoña Galindo, AIMPLAS**, indicated that the bio-plastics are expected to grow from 2% of the world market in 2015 to 40% in 2030. She presented the example of fish processing waste: 2 million tonnes/year is generated annually in Europe. Testing in the DAFIA project [www.dafia-project.eu](http://www.dafia-project.eu) (see pinfa Newsletter n°86) has shown that DNA and gelatin recovered from fishery wastes can be an effective flame retardant in polyamide combined with lignosulphonates (UL94-V0, 1.6 mm, at 20% loading). Challenges include higher smoke production than with commercial phosphorus flame retardant, black colour and deterioration of mechanical properties.



**Belén Redondo, AIMPLAS**, presented the example of bio-based FRs derived from poultry production by-products (feathers, of which 3 million tonnes are generated annually in Europe). In the KaRMA project [www.karma2020.eu](http://www.karma2020.eu) (Horizon 2020), functionalised keratins are being tested for FR coating of textiles and construction sector materials (e.g. wood and concrete); and the feathers themselves to bring both structure and fire resistance in composites with bio-derived polymers (humins from carbohydrates).



**Fouad Laoutid, Materia Nova, Belgium**, outlined a number of research areas looking at PIN flame retardant solutions for polylactides (PLA), using bio-based flame retardants or phosphorus-based protective coating by plasma enhanced chemical vapour deposition (PECVD) of phosphorus compounds onto polyester fibres. The plasma deposition achieved self-extinguishing in PLA woven fibre, with very thin deposit layer (<1µm), without deteriorating color or feel. He also presented new results on the preparation of inherently flame retardant PLA obtained by the insertion of DOPO based molecules (phosphorus containing) into the PLA polymer chain by ring opening polymerization and reactive extrusion. This phosphorylated PLA shows V0 classification at UL-94 even when blended with virgin PLA (50/50 wt/wt).



**Gerard Lligadas, University Rovira i Virgili, Spain**, also showed a number of different research directions based on castor oil-derived undecylenic acid. He first described possibilities for polymer synthesis and presented preparation of various phosphorus, silicon or boron-containing bio-based polymers, both thermoplastic and thermosets. Examples include reaction of DOPO (phosphorus PIN FR) into polymers. The presence of such heteroatoms in epoxy resins, polyurethanes and polyesters was demonstrated to be effective on improving the flame resistance of the materials. Boron-functionalised bio-based FRs were suggested to act to neutralise radicals in the gas phase during fire.



**Ehsan Kalali, IMDEA Madrid**, summarised research into use of different nano-forms of minerals as synergists for PIN flame retardants, including ferrocene (nano iron oxide  $F_2O_3$ ), layered double hydroxides (LDH) with nano nickel hydroxide, nano cobalt hydroxide, zinc cobalt. These inorganic nano compounds, at doses of up to 5%, have been shown to be highly effective in reducing smoke emissions (in some cases, nearly 60% less smoke) and in improving fire performance (e.g. reduction in peak heat release rate pHRR). It is hypothesised that these nano particles act in the gas phase by rapidly converting to char the flammable volatile compounds released by polymers in fire (by condensation or catalysis), thus preventing these gases burning.



**Laura Martí and Miguel Angel Valera, Aimplas**, presented a diversity of research routes towards integrating PIN flame retardancy into plastics, including reactive and polymeric / oligomeric PIN FRs, and resulting in intrinsically FR polymers. Approaches include integration of phosphorus or phosphorus-nitrogen groups or monomers into polymer chains, or grafting of phosphorus groups (e.g. DOPO based) onto polymers. Work presented covered polyethylene, polypropylene, polyamide, PET, ABS (project Flash with ELIX Polymers and Universidad de Cantabria). Cross-linking of polymers can also improve fire performance (e.g. polyurethanes) but modifies mechanical properties. Aimplas is testing “reactive extrusion” (REX), where PIN FR functional molecules are reacted with polymers during extrusion, using a specifically designed research and testing extruder and control software.

## Industrial applications: recycling, 3D-printing, XEV



**Arthur Schwesig, MGG Polymers, Austria**, presented the company's activity "urban mining" materials from end-of-life plastics. He presented examples of consumer products today produced using recycled plastics, recovered and re-compounded by MGG from waste plastics. The performance of sorting of the waste plastic stream is essential, and is a key part of MGG's know-how: whilst a 10% error rate in recycling is adequate for downcycling, recycling for polymer use in technical applications requires at least 98% accuracy in sorting. This is a real challenge: for example, end-of-life automotive plastics must be separated into over 200 distinct streams. MGG now offers a PC-ABS polymers based on post-consumer recovered plastics: UL94-V0 (3 mm), a full range of colours, bromine-free and recyclable, with the "Circularity Approved" label (developed with Fraunhofer). Mr Schwesig underlined the difficult problem of dealing with post-consumer plastics containing brominated flame retardants, for which no recycling routes are available in Europe.



**Adrian Beard, Clariant**, explained that the company decided voluntarily to move out of halogenated flame retardants in the late 1990s, considering them to be non-sustainable. Indeed, the products in question are today banned or on REACH evaluation lists. Clariant is also looking for routes to phosphorus flame retardants which avoid  $PCl_3$ . Clariant has also developed a phosphorus based synergist as a substitute for zinc borate, because of concerns resulting from the classification of other boron compounds (see pinfa Newsletter n°91). Clariant's product policy is driven by the company's internal portfolio sustainability assessment system with its "Ecotain" label for best-in-class products (pinfa Newsletter n°79) based on independent external evaluations, such as ENFIRO and GreenScreen (pinfa Newsletters 36 and 100).



**Antonio Nerone, Dupont**, summarised the need for PIN fire safety solutions for electric vehicles (XEV) and the considerable new performance requirement challenges posed by this market. It is estimated that a third of the world car market will be electric or hybrid by 2030. The high voltage and currents required for electrical motorisation, combined with increasing use of plastics in vehicles for design performance and weight gain, imply both considerably increased fire risk (more electrics with risks of arcing, overheating, specific fire risks of batteries ...) and more demanding materials requirements. Materials requirements are multiple and daunting: electrical (CTI, dielectric), mechanical, heat and chemical resistance and durability, thermal stability (CLT) and warpage, processing (thin parts), density, aesthetic and visual (e.g. the orange colour, essential to enable identification of high-voltage cables in case of maintenance or accident). PIN FRs (with non-halogenated pigments) enable "low halogen" solutions, important to avoid halide emissions leading to voltaic corrosion. The need for tighter fire safety is recognised, but clarification is needed on standard specifications: UL94-V0 (but for what thickness?), EN 62368 "communications" systems (increasingly required by car manufacturers).



**Sebastian Hörold, Clariant**, discussed flame retardants for 3D-printing. The market today for 3D-printing polymers is around 1.2 billion US\$, with an expected growth of +75% per year. There are three main technologies today: powder bed laser fusion (currently limited to polyamides PA12 and PA11), laser photo-polymerisation (certain photo-polymers) and filament or pellet extrusion (which functions rather like an ink-jet printer). Clariant has developed PIN FR solutions for filament extrusion, able to achieve UL94-V0 (0.4 mm) after printing and low-smoke density according to NFPA 130 (and according to EN 45545 under way), with limited mechanical performance loss compared to neat polymer (polyamide 6/66 to date). For powder bed laser fusion there are also already PIN FR solutions commercially available (e.g. from EOS GmbH, Krailling, Germany), which are dry blends of polymers (uniform 20 µm powder blended with flame retardant) able to achieve UL94-V0 (2 mm) for aircraft and E&E applications.



**Brigit Fassbender, Budenheim**, presented developments in nitrogen and phosphorus inorganic (PIN) flame retardants for different polymers. These PIN FRs function by generating an intumescent char layer on the surface, which isolates the polymer from fire and also reduces smoke release. Widely used PIN FRs such as melamine cyanurate, melamine polyphosphate or ammonium polyphosphate offer good eco-toxicity properties and high thermal stability, but pose challenges in thin applications because the polymer content is insufficient to generate protective char (difficult to achieve UL94-V0 below 0.8 mm). Difficulties of compatibility between such inorganics and polymers can lead to migration of the FR to the surface (blooming). These challenges are addressed by adapting FR formulations, including specific coatings, for different polymers. These formulations can deliver intumescent fire performance, whilst conserving or even improving materials properties such as elasticity or elongation at break.



IV edition of the 'Fire-retardant Plastics Conference', AIMPLAS & pinfa, Valencia, Spain, 4<sup>th</sup> April 2019 <https://www.aimplas.net/blog/aimplas-pinfa-host-iv-edition-fire-retardant-plastics-conference/>

## PUBLISHER INFORMATION:

This Newsletter is published for the interest of user industries, stakeholders and the public by pinfa (Phosphorus Inorganic and Nitrogen Flame Retardants Association), a sector group of Cefic (European Chemical Industry federation). The content is accurate to the best of our knowledge, but is provided for information only and constitutes neither a technical recommendation nor an official position of pinfa, Cefic or pinfa member companies. For abbreviations see: [www.pinfa.org](http://www.pinfa.org)