



Annual Report

2019

pinfa

Phosphorus, Inorganic & Nitrogen Flame Retardants Association

www.pinfa.eu



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FOREWORD

2019 saw unprecedented technological breakthroughs, such as successful landings of reusable unmanned rockets, eradication of 2 of 3 polio stems or the very first observable image of a black hole. Prof. Michio Kaku often reminds us that we now have more computing power in our backpocket than the NASA had when men were first sent to the Moon ... Yet, despite this profound progress, fire keeps being a threat to our society and lifestyles: when Notre-Dame caught fire earlier this year, nothing could be done to stop the flames from destroying the eightcenturies old monument. The easiest fire to quench is the one that never sparkles; to achieve that, we need to promote greater awareness of fire safety, develop safer designs and rely on fire-resistant materials. pinfa is proud to be part of the solution for a safer world.

Since 2009, pinfa has been advocating for the promotion of safer flame retardants. The growth of our organisation spreading across three continents is a proud testimony of our success. Our value-chain approach bringing together manufacturers of flame retardants and their downstream users like distributors, compounders and OEMs facilitates integrated collaboration on our substances' portfolio. Recently, the pinfa Product Selector has been revised to reflect the most up to date contents on the known PIN FR formulations. As the most visited page of the website, it is a strong endorsement for our transparency goal. As you will read in these pages, pinfa has been very active to ensure our commitment in favour of safer, greener flame retardants stays a top priority for policy-makers.

Together, let us promote durable and sustainable fire safety solutions.

Yours faithfully,



Jonathan Crozier
Pinfa Secretary General

A handwritten signature in black ink, appearing to read 'Jonathan Crozier'.



Adrian Beard
Pinfa Chairman

A handwritten signature in blue ink, appearing to read 'Adrian Beard'.

PROJECT REPORTS

Electromobility & Fire Safety challenges

The automotive value chain is facing new challenges in the area of electromobility such as compliance with standards and requirements of materials, choice of flame retardants, compliance with fire safety regulations and future demands of a circular economy. While the momentum on electromobility is strong, pinfa wishes to catalyze discussions and offer support in order to enable international cross-fertilization between Europe and other parts of the world. Empowered by the success of the Chinese workshop in Shanghai in 2018, pinfa members prioritized Japan and EU as the next zones where synergies could be created. Together with sister association pinfa China and our local members, pinfa Europe has paved the way for a closer collaboration between stakeholders of the Electric-automotive value chain.

TOKYO, JULY 1ST, 2019

At its 2nd Electromobility and fire safety challenges workshop, Tokyo, 1st July 2019, pinfa brought together more than 60 stakeholders of the electromobility value chain: automotive companies, OEMs, plastic compounders and manufacturers of flame retardants. Held as a satellite workshop of the Electro Mobility and Circular Economy (EMCE) Conference, this workshop looked at specific issues of the Japanese market, extending the discussions kicked off last November in Shanghai and addressed the trends and challenges of the thriving electromobility market: Battery EV, Plug-in EV and Hybrid EV. Heavier batteries (up to 400 kg) push further

structural weight reduction in cars, and metal parts are replaced by multi-material compounds (e.g. polymeric resins, fiberglass, carbon fiber), with epoxy and polyurethane being among the most used polymers. Battery casings face increasing pressure to be lighter and more effective, while the size of the cells is plummeting, possibly resulting in a higher flammability risk because of the higher energy density. Flame retardant formulations, either in the plastic or as intumescent



Image: Speakers of the pinfa Electromobility workshop in Japan – 01 July, Tokyo



DARMSTADT, NOVEMBER 12TH

With this workshop in Darmstadt, the heart of the Rhine Main area, pinfa, the German Research Society for Polymers (FGK) and the Fraunhofer LBF Institute aimed to bring together the whole value chain on electro-mobility. Our goal is to kickstart discussions on fire safety challenges in electro-mobility: while the change towards electromobility is irreversible, standards are undefined and the automotive value chain appears to be less aligned when it comes to this important topic.

More than 100 participants joined in this 3rd Electromobility workshop, after the successes of the Shanghai and Tokyo editions earlier this year. Representatives from the automotive industry (OEMs, tier 1 supplier, etc.), from the chemical industry (flame retardants manufacturers, distributors), from the polymer industry (compounders, recyclers etc.) and beyond (academia, civil society, fire testing laboratories, etc.) participated.



coatings, are instrumental in keeping EV safe. UN regulation R100-03 already prescribes flame retardancy from external source of ignition for battery packs and it is expected that international standardisation will address internal sources of ignitions in the near future. Speakers from automotive manufacturers Honda and Nissan shared presentations on the projected automotive trends towards the 2020s.

Tomorrow's vehicles are expected to be CASE: Connected, Autonomous, Shared and Electric: MaaS (Mobility as a Service) is a paradigm change. With an expected life cycle of at least 15 years, flame retarded EV parts must endure weathering with challenges of material stability. Recycling these parts is a developing industry. Non-halogen substances developed by the pinfa members are praised for their better environmental profile throughout the life cycle of the vehicle. *Supported by pinfa member companies Adeka, Clariant and Dupont, this workshop has received unanimously positive feedback from the participants. Presentations are available at <https://www.pinfa.eu/mediaroom/pinfa-electromobility-fire-safety-challenges-workshop-japanese-edition/>*



Images from the pinfa Electromobility workshop in Germany – 12 November, Darmstadt



Results highlight that phosphorus, inorganic or nitrogen-based flame retardants have no significant negative impact on the evaluated parameters of the study (CIT_{NLP} , $CIT_{4 min}$, $CIT_{8 min}$ and Ds values) under the testing conditions. In fact, several flame retardants can have a positive impact on the evaluated parameters when used judiciously.

PROJECT REPORTS

Smoke Toxicity Study : Behavior of PIN flame retardants

Over the past 2 years, twelve pinfa members companies provided 94 commercial polymer samples for fire testing, to evaluate the impact of flame retardants on smoke density and toxicity hazards.

CREPIM evaluated the smoke toxicity and the smoke density according to two well-recognized protocols: the norm NF X 70-100 at 600°C (tubular furnace) and the ISO 5659-2 with Annexe C of EN 45545-2 method (smoke chamber) at 50 kW/m².

Evaluated parameters were the Conventional Index of Toxicity for non-listed products and toxicity index at 4 or 8 minutes (CIT_{NLP} , $CIT_{4 min}$, $CIT_{8 min}$ as per EN 45545-2) as well as smoke density values at various time intervals (Ds_{MAX} , Ds_{10} , Ds_4 , $Ds_{1.5}$ and calculated VOF_4 values).

Tested polymers include polyolefins such as polyethylene

or polypropylene (HDPE, LLDPE, PP), polystyrene (PS), polycarbonate (PC), polybutylene terephthalate (PBT), epoxy resins, polyamides (PA6, PA66, PPA and PA6+PA66 blend), polyurethanes (PUR, PIR) and polyvinylchlorides (p-PVC, u-PVC). All samples were tested as plates at the same thickness (3 mm), except polyurethanes foam samples (19 mm). For each different polymer matrix, reference samples (virgin polymers, 26 samples), samples containing brominated or chlorinated FR (halogen-based FR, 15 samples) and samples containing PIN FR (53 samples) were tested for inter-comparison. Multiple grades of polymers have been tested, however, it remains difficult to generalize the results to different fire scenarios or material combinations based solely on laboratory tests.

The results will be made available on the pinfa website and will also be published at AMI Fire Resistance in Plastics 2019 conference, in Cologne this December.



SAMPLES

94



120 K €

pinfa's share

12



COMPANIES

2

PROTOCOLS:

NF X 70-100 at 600°C (tubular furnace) and the smoke density according to the ISO 5659-2 with Annexe C of EN 45545-2 method (smoke chamber) at 50 kW/m²

General conclusions

Effect compared to neat polymer:

- Much worse
- Slightly worse
- Neutral
- Neutral to better
- Better

Polymer	Toxicity Concern	PIN FRs effect Toxicity	Smoke Density	Halogen / Br-FR effect Toxicity	Smoke Density
Polyolefins (PE,PP)	CO, CO ₂				
Polystyrene (PS)	CO				
Polycarbonates (PC)	CO, CO ₂				
Polyesters (PBT)	CO, HCN, NO ₂			Not evaluated	Not evaluated
Epoxy resins	CO, HCN				
Polyamides (PA6,PA66)	CO, HCN, NO ₂				
Polyurethanes (PUR, PIR)	CO, HCN, NO ₂				
Polyvinylchloride (u-/p-PVC)	HCl	(1)	(1)	(1)	(1)

(1) minor impact of flame retardants on toxicity and smoke, however, in all cases huge contribution from HCl exceeding threshold values by far
04 December 2018



PROJECT REPORTS

Recycling of Flame-retarded plastics

2019 has been a milestone for pinfa Recycling activities, with a joint workshop organized this April in Valencia, together with the Spanish Institute for Plastics (AIMPLAS) and the completion of the Fraunhofer LBF collaboration, that delivered a video summary of the undertakings led under the pinfa umbrella.

The fourth Fire Retardant Plastics Conference, organised by AIMPLAS with pinfa support in Valencia, Spain, 4th 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 Chairman, opened the conference which presented both research and company product innovations in PIN flame retardants, with the theme “Recyclability, sustainability and future trends”.

In the first session focused on new developments in bio-based flame-retardant additives: the French enterprise C2MA Mines Alès presented the challenges and possibilities

of bio-based flame-retardants; the Belgian firm Materia Nova explained the preparation of the new flame-retardant polylactide through reactivation, and the Universitat Rovira i Virgili talked about bio-derived flame-retardant polymers. AIMPLAS also took part by talking about the progress of bio-based flame-retardants for polyamides and thermosets.

The second session focused on the Circular Economy. The Austrian company MGG polymers addressed the challenge of recycling halogen-free flame-retardant polymers. Finally, Clariant explained the sustainability of phosphorus-based flame-retardants.

The one-day seminar concluded with the session on new trends and future applications in which fire retardant plastics are a key element. The pinfa associate member company Dupont gave a presentation about the state of the art of flame-retardants in the electromobility sector, while flame retardants in 3D printing applications were also addressed by fellow member company Clariant. Concluding this workshop,



pinfa member company Budenheim addressed the application of phosphorus and nitrogen-based flame-retardants in new sectors and IMDEA Materials (Spain) developed the issues related to the molecular and functional design.

Finally, AIMPLAS concluded with intrinsically flame retardant polymer synthesis and the advantages of its processing by reactive extrusion as a more efficient process.



Image: pinfa Fraunhofer LBF video on Recycling challenges of PIN FR



Images from the pinfa-AIMPLAS workshop on Recycling – 04 April, Valencia



*This tax, introduced in 2017,
... can reach up to around 40 €
per item.*

PROJECT REPORTS

Swedish Tax on Chemicals : pinfa's alternative proposal

Following on from 2018, pinfa supported the organisation of a stakeholder meeting on the Swedish chemicals tax on flame retardants, in Stockholm, on 17th September 2019, where the case for a revision of the tax was presented to Swedish stakeholders including parliamentarians.

This tax, introduced in 2017, hits all electrical and electronic equipment sold to the public in shops in Sweden (but not over internet from abroad), and can reach up to around 40 € per item (e.g. white goods such as a washing machine).

However, it is widely criticised because the current criteria do not stimulate safer chemical substitution, because they target the wrong chemical properties by targeting not only halogenated FRs but also all additive phosphorus FRs. There are no standard test methods to identify the chemical groups defining the tax levels, leading to legal uncertainty. The Swedish chemicals agency KEMI has already recommended that the tax should target inherent individual substance properties, with identified testing methods, and that e-commerce must not be excluded. pinfa has been recommending to revise the tax, with the support of an expert group, to review the scope of which flame retardants are targeted, and to include a zero tax rate to ensure an effective push to safer chemical substitution.

WHY THE INTENDED GOALS OF THE CHEMICAL TAX ARE NOT MET

The overall goal of the chemical tax is stated to reduce the supply of hazardous substances in people's home environment and at the same time stimulate companies to select safer alternatives. For the following reasons, these goals are not met:

- the wrong chemical properties are taxed which leads to false and regrettable substitution, i.e. the tax law is counterproductive to its goals. This is very unfortunate as it creates an incentive for the taxable product manufacturer to select flame retardants that qualify for maximum tax reduction instead of selecting safer alternatives
- there is no possibility to monitor and check the right tax reductions as standardized test methods are missing for almost all the substances in the appendix to the legislation, which creates legal uncertainty – and cheaters may benefit.



WHAT SHOULD BE DONE TO GET IT RIGHT

The signatories¹ of this paper strongly suggest to revise the Swedish Tax on chemicals in certain electronics (Lag 2016:1067). To do so, the following immediate actions are suggested:

- ✓ KEMI or the Swedish EPA should be tasked with checking the effectiveness of the current tax
- ✓ the basis for taxation should be the individual substance intrinsic hazardous properties and risk
- ✓ a chemical expert group should be established with representatives from KEMI, Chemsec, TCO Development, the Swedish Centre for Chemical Substitution and Industry
- ✓ the responsibility of the expert group is to review potential FR assessment schemes, replace the current annex to the law with a list of substances supported by independent assessment reports
- ✓ other flame retardants than those containing bromine, chlorine and phosphorus could be considered to be added to the revised law
- ✓ to maximize the industry substitution incentive, a zero tax alternative should be considered.

With the implementation of these suggested actions, the signatories believe that the Government's environmental goals will be met whilst at the same time the industry incentive to move to safer alternatives is strengthened.

A more detailed white paper is available on pinfa and IT Telekomföretagen websites.

¹ In general, most industry stakeholders do not support taxation of chemicals. Instead the EU rules of REACH and RoHs should be followed. Other stakeholders believe that chemical taxation could be a powerful instrument. But, all of the signatories to this document believe, that if the Swedish chemical tax law stays, it urgently needs to be revised.

COMMUNICATION & OUTREACH

pinfa Newsletter : your information hub

The pinfa monthly Newsletter positions pinfa as a reference information source on innovation in PIN flame retardants and on fire safety. It covers developments worldwide, and particularly in North America and in Asia. The Newsletter provides objective, non-commercial summaries of information on PIN FR chemistry and applications, R&D, events, regulation and standards, fire safety, health and the environment. This wide content approach positions pinfa as an active information hub and competence centre for the FR industry, for downstream FR users and for stakeholders and decision makers. With special issues on conferences, twelve issues published in 2019, and now a proud history of over 100 back issues, the pinfa Newsletter also positions pinfa as a recognised and reliable source for the flame retardants industry and for fire safety.

The Newsletter welcomes input from companies on PIN fire safety developments and performance. Please send any news or information of interest to pinfa-consultant@thornton.fr



Fire Safety in the EU

At the initiative of pinfa, 25 fire safety stakeholder organisations signed a joint letter to the European Commission asking that fire safety be integrated into the EU's 100 billion € R&D funding programme, Horizon Europe (2021-2028). Signatories include fire fighters organisations, a range of industry federations concerned by fire safety, fire safety associations, wildfire organisations and research centres. This is the first time that these organisations have engaged an initiative together. It follows a first meeting organised by IAFSS (International Association for Fire Safety Science), with pinfa support, in December 2018 (pinfa Newsletter n°97) and is parallel to the initiative of over 200 scientists launched by the Pau Costa Foundation (pinfa Newsletter n°93). The stakeholders' joint letter sent by pinfa to the European Commission underlines that *"fire safety is essential to enable a desired future. Fire safety science is a prerequisite for innovation, sustainability and an inclusive society. Fire safety is key to resilience in contexts of technological developments, sustainable construction, an ageing population and climate change"*.



<https://www.pinfa.eu/mediaroom/fire-safety-organisations-co-sign-letter-to-europe/>

Events

pinfa's participation at a range of industry and science conferences enables engagement with flame retardant users, researchers and specialists, stakeholders and decision makers. Dialogue is enriched by summarising of key events in the pinfa Newsletter, with exchanges to confirm speakers' key messages and interviews of conference organisers, companies and experts.

In 2019, pinfa Newsletter special editions covered AMI FRiP (Flame Resistance in Plastics, Cologne), FRPM 2019 (Flame Retardant Polymeric Materials) and Interflam 2019, with interviews of Gustav Grolman, Wells Plastics, Beaulieu International, Lubrizol, Lehmann & Voss, BÜFA Composite Systems, Biesterfeld Spezialchemie, Hellenic Cables, Marmon Innovation, Bekina Compounds, Teknos, Nordtreat, Covestro, Huntsman Polyurethanes, BASF Polyurethanes, Sika Technology, Branz New Zealand, University of Maryland and Dow.

The pinfa initiative of a panel discussion on flame retardants in plastics recycling at the AMI FRiP Cologne conference, first organised by pinfa in 2018, is continued in 2019 with Flame Retardants Europe, AMI, pinfa, ICL, Campine and Fraunhofer LBF.

In addition to organising our own events (on electromobility, ecotax ...summarised in this Annual Report), pinfa also made presentations and participated at IERC (International Electronics Recycling Congress), EMCE (E-Mobility & Circular Economy), Crepim Fire Safety Day, EAPFP (European Association for Passive Fire Protection) General Assembly, NeRSAP 9 (Network of REACH Socio-Economic Analysis Practitioners), FIEP Plenary (Fire Information Exchange Platform) and many more.

Full listing of fire safety and flame retardant conferences and information about pinfa and pinfa-NAworkshops:

<https://www.pinfa.eu/media-events/events/>



pinfa Website at a glance

Building on the work initiated in 2018, pinfa has further developed the information made available on the website, with new sections dedicated to the work of our Advisory Board and both our sister organisations pinfa NA and pinfa China get a page on our EU website, on top of their respective websites

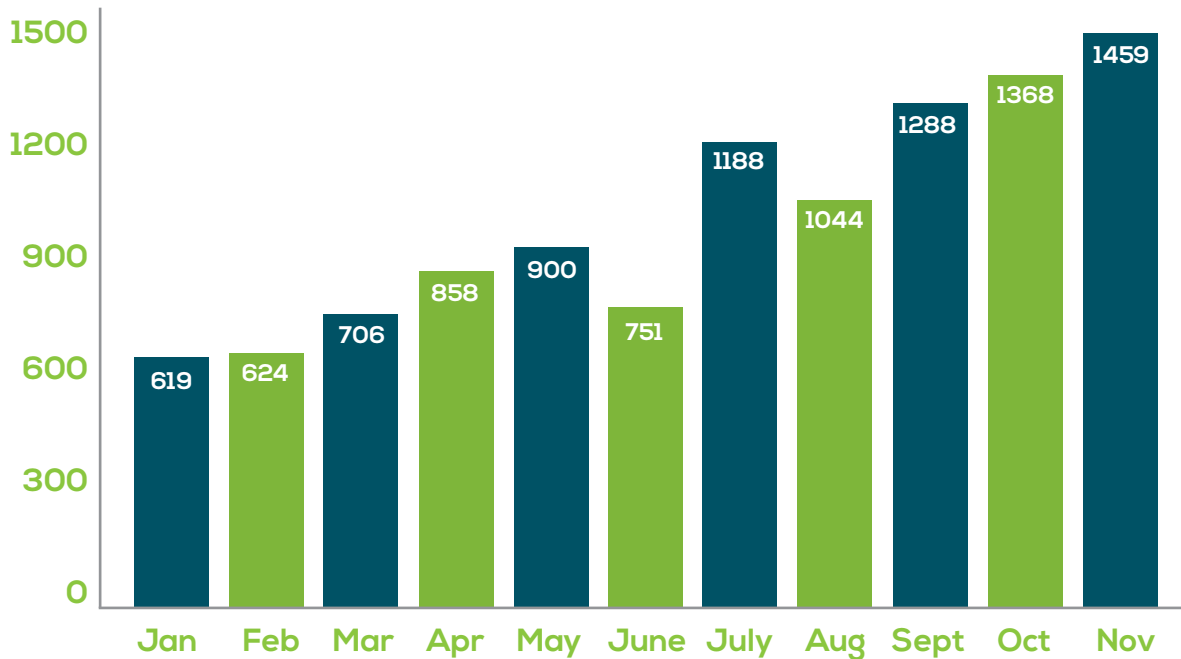
We also updated the product selector, our most visited website page, with up-to-date information on the available substance portfolio. The following substances have been edited, and where possible a summary was added with external references documenting scientific evidence on the substance. pinfa members and external stakeholders are free to send us any information they may have to help making the product selector the best database on PIN flame retardants.

Product	Amendment
Ammonium Polyphosphate	Description added
Phosphorus Polyol	Description added
Red Phosphorus (diespersions)	Description added
Red Phosphorus	Description added
Melamine Polyzinc Phosphate	Supplier - update form Catena to Huber
3,9-Dimethyl	Trade Name - added
Ammonium	Trade Name - added
Melamine Borate	Trade Name - removed
Melamine Polyzinc Phosphate	Trade Name - removed
Melamine Polyaluminium phosphate	Trade Name - removed
Boehmite	Category added : Textiles / Hot melts
Mixtures of esters of phosphoric acid	Supplier name - removed
P/N based intumescent system – 4	New product
Melamine cyanurate	Trade Name + description + reference
Melamine polyphosphate	Trade Name + description + reference
Monomeric N-alkoxy hindered amine	Trade Name + description + reference
Melamine-poly(aluminium phosphate)	Supplier name - removed
Melamine-poly(zinc phosphate)	Supplier name - removed
Dimethyl propylphosphonate	Category added : PVC / nitrile foam
Oligomeric phosphate ester	New product
Phosphorus compound	New product
Butylated triphenyl phosphate	Category added : Foams-PVC / nitrile foam
Cyclic Phosphonate	Supplier name - added
IPPP - Isopropylated phenol phosphate	Supplier name - added
IPPP - Isopropylated phenol phosphate	Category removed : Foams-PUR flexible foam
N,N-(bis)-hydroxyethyl-aminomethane phosphonic acid diethyl ester	Category added : Foams-PUR flexible foam
CDP - Cresyl diphenyl phosphate	CAS removed
Dipentaerythritol	Supplier name - added
Pentaerythritol	Supplier name - added
Aluminium Tri Hydrate	Description added
Boehmite	Description added
Diethylphosphinate	Description added











Most visited page is the **Product Selector**

Website Statistics

Number of visitors over 11 months



Total: 10805

Country	Users
 United States	2634
 Germany	992
 United Kingdom	547
 China	505
 Belgium	423
 Japan	386
 India	374
 France	338
 South Korea	314
 Netherlands	254

Total: 9419

pinfa advisory board

The fifth pinfa advisory board meeting took place on the 12th of June 2019 at the PIVO institute near Brussels, Belgium. A diverse group of stakeholders from the flame retardant (FR) industry, downstream user industries, testing and research institutes and representatives from firefighter departments and environmental specialists came together for a first hand demonstration of fire safety and to discuss the following topics.



pinfa AdBoard session at PIVO Firefighter training centre – 12 June, Relegem™

1. SMOKE IS A KEY FACTOR IN FIRES THAT SHOULD NOT BE UNDERESTIMATED

Firefighters highlighted that flames are not the most dangerous part of a fire, but smoke and the flammability thereof. Modern products, which most often contain plastic, tend to emit a lot of toxic smoke. Smoke is always toxic, with carbon monoxide being most prominent for acute toxicity and always being present

when carbon containing material is burnt. Depending on other materials present, toxicants like hydrogen cyanide or hydrochloric acid can also become relevant. This development facilitates flashovers and shortens the time until a room is fully on fire. Fire fighters consider this the main risk factor in modern firefighting. Compartmentalization is an important factor as well: the more a fire can be contained within a closed space, the less quickly it will likely develop and therefore gives more time for people inside a building to escape or be helped to escape. Fire fighters are therefore calling for a holistic fire safety approach. One important contribution to increased fire safety are smoke detectors: they are relatively cheap and a practical solution, especially when people cannot afford less combustible products such as those made from wool. (See more under section 5).

2. FIRE TESTING OF PRODUCTS SHOULD ALSO INCLUDE UNDER-VENTILATED SCENARIOS AND SMOKE EMISSION

During product flammability tests the impact of smoke is often not considered, because the ignition and flame spread in the early phase of a fire are the focus. By the time fire fighters arrive at a fire scene, fires have become under-ventilated and are producing copious amounts of smoke. Therefore, fire fighters suggest that leaving smoke out of tests reduces the relevance of those tests to real-life situations.

3. NEW PRODUCTS AND FIRE SAFETY SHOULD WORK HAND IN HAND

Firefighters are often insufficiently aware nor trained to deal with new materials and products. For example, accidents with electric cars pose a new type of fire hazard. Fire fighters are not involved in the development of these products and often need to improvise a firefighting strategy. The composition of modern products is very different than in the past: sofas are lighter and consist of polymers, which give off a lot of flammable and toxic smoke, increasing the risk of flashovers. Tackling this problem is difficult because the composition of modern materials is often confidential, but is also relevant to the circular economy and the plastics strategy objectives and efforts.

Advisory Board Principles

The meetings of the Advisory Board aim to bring a wide range of stakeholders together to discuss topics related to fire retardants and fire safety to achieve synergies and increase overall understanding of the challenges we face. We encourage varied viewpoints to be shared in order to learn from each other's experiences and perspectives.

In order to guarantee an atmosphere of openness and trust, the discussions take place under the Chatham House rule. This means that reports reflect attendance and the content of the discussions but without attribution of statements to individual participants.

Topics discussed during the meetings range from scientific or policy discussions to practical classes with firefighters. Concretely, recent meetings discussed:

- ▶ Smoke toxicity and flammability
- ▶ Fire testing of products
- ▶ Cooperation with firefighters during the development of new products
- ▶ Harmonizing fire safety advocacy
- ▶ The need to coordinate and inventory the training of firefighters and statistics of fires throughout the EU

- ▶ The importance of socio-economic considerations in shaping fire safety policies
- ▶ The role of fire retardants in fire spread
- ▶ Circular economy goals and the link to fire safety
- ▶ The importance of socio-economic considerations in shaping fire safety policies

4. THE TRAINING OF FIREFIGHTERS AND STATISTICS ON FIRES ACROSS THE EU SHOULD BE INVENTORIED AND DISCUSSED

There are substantial differences both in the training and priorities of fire brigades across Europe, and data gathering is even more inconsistent. A common theme is a lack of resources in fire departments to execute a holistic range of functions. For example, Belgian firefighters are very well trained in extinguishing fires but do not focus on prevention efforts, while in Paris firefighter services are highly rated and have proven very vulnerable to rapid fire progressions. German fire departments have many more volunteers than other countries, but they lack dedicated training for every member. Taking stock of different types of training and specialities of fire departments can help pointing out best practices and identify areas of improvement. A good example is the United States Fire Administration, which harmonizes

statistics and training. This can improve the collection of data in the EU which helps in drawing policy conclusions and sharing best practices.

5. SOCIO-ECONOMIC CONSIDERATIONS SHOULD INFLUENCE POLICIES ON FIRE SAFETY

Low-income households are less likely to buy higher quality appliances and furniture which may be less flammable. Home fires remain a socio-economic phenomenon: lower households suffer from more fires than higher income ones, also because landlords/landladies do not necessarily install smoke detectors partly due to them not always being obligatorily required in rented housing. In addition, a more careless lifestyle leads to a higher risk of fire accidents at home. In Estonia a big campaign funded extensive fire safety checks and installed smoke detectors across the country that serves as a first example to consider when tackling this issue.



PINFA GLOBAL OPERATIONS

For over a year, pinfa has been operating on three continents. Our European group created in 2009 has been a role model for extension to two new regions: North America in 2012 and then China in 2018. While the three groups have independent resources and different membership, our vision and mission remain aligned. 2019 has seen the first coordination initiative between pinfa EU, pinfa-NA and pinfa China: bi-monthly calls have been set up to brief each other on our respective progresses and challenges. For 2020, pinfa aims at a tighter collaboration, with the possible first global meeting of pinfa on our radar.

PINFA NORTH AMERICA

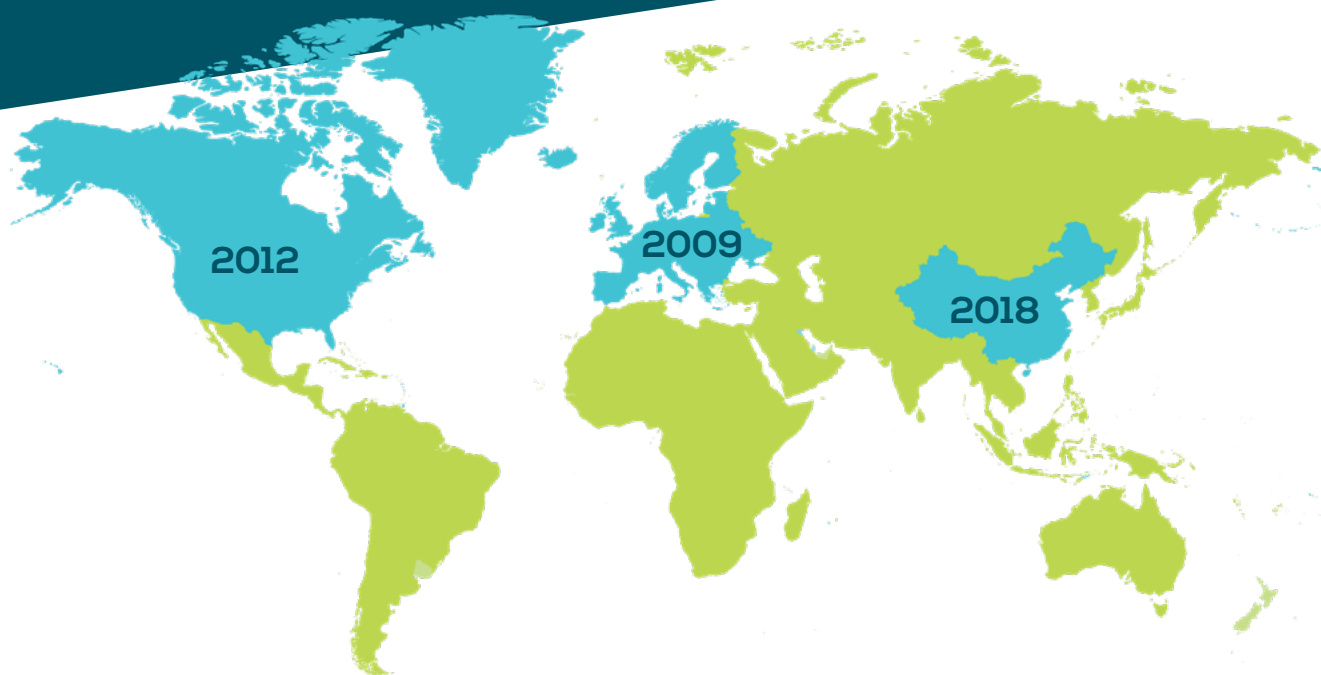
To promote the beneficial aspects of phosphorus, inorganic & nitrogen flame retardants; pinfa-NA was present at eleven industry events across North America during 2019. Information sharing occurred at a variety of trade shows and technical conferences including wire & cable, CAMX Advanced Composites, U.S. Federal Aviation Administration Fire & Cabin Safety Research Conference and Greenbuild Exposition 2019. Since 2012, the goal of pinfa-NA members has been to engage stakeholders within the important E&E, transportation and building & construction market sectors.

Two key industry events were organized by pinfa-NA during 2019. At the Society of Plastic Engineers' annual technical meeting held in Detroit, Michigan, pinfa-NA hosted a technical session focused on fire safety in transportation. Experts from Central Michigan University and the start-up company Inovia Materials LLC presented information concerning new FR technologies. Dr. Jeffrey Helms, Global Automotive Sales Director at Celanese gave an informative talk concerning the "Evolution of Automotive Standards for Flammability, Odor and Emissions". Dr. Helms stated that meeting odor and vehicle interior emission requirements is not a simple challenge. Across the globe, country and OEM

VOC methodology plus limits are fragmented thereby adding complexity. Some of the automotive megatrends concerning electrification, light-weighting, connectivity and sustainability were also discussed. It was stated that OEMs will be investing a massive \$90B in electromobility over the next decade.

pinfa-NA returned to the heart of Silicon Valley, San Jose California during 2019! As a follow up to its 2013 conference, pinfa-NA again hosted a 1 ½ day conference entitled "Design for Fire Safety in Greener Electronics". Key organizations including OEMs, component suppliers, green chemistry and other stakeholders were in attendance. IBM, Hewlett-Packard, Texas Instruments and Corning communicated the needs of the electronics industry concerning fire safety and material design. Dr. Thomas Fabian of UL reported on the widely publicized topic of "Lithium Ion Batteries and Fire Safety". Daphne Molin from the California Department of Toxic Substances Control reviewed the state's "Safer Consumer Products Program" including flame retardants. Lauren Heine, Ph.D. of MaterialWise stressed that increased use of chemical hazard profiles for proactive decision making will ultimately lead to safer products for all.

During 2020, pinfa-NA will be hosting technical sessions at Society of Plastics Engineers ANTEC in San Antonio, Texas and at SAMPE 2020 Seattle, Washington with a focus on FST compliant advanced composites for transportation including aviation. To date, pinfa-NA has confirmed speakers from Boeing, U.S. FAA, Underwriters Laboratories and other key players in the transportation supply chain. Finally, an informative and innovative 1 ½ day Non-Halogen Flame Retardant Formulation Course is being planned for October 2020 at Case Western Reserve University in Cleveland, Ohio. In addition to classroom lectures, participants will receive hands-on laboratory instruction and a tour of the CWRU fire science laboratories.



As the need for fire safety increases due to increasing use of synthetic materials, pinfa-NA will continue to collaborate and provide education to stakeholders concerning the safe use of PIN flame retardants and materials. Over the past decade, environmental NGOs and state legislatures have voiced their health and safety concerns about flame retardants as a class of chemicals. pinfa-NA will continue to provide information about the safety of its products and the role of flame retardants for overall fire safety in North America.

PINFA CHINA

pinfa China starts to take shape in 2019 as a new organization, some basic infrastructure work has been well done. E.g. they modified the operation rules based on Chinese law and pinfa China launched the WeChat official account on June 18th 2019 to share information about PIN fire safety, exhibitions and events, news on government regulations through this platform. They can also publish some newsletters or articles to the value chain. The pinfa China website (www.pinfachina.com) was also launched.

pinfa China has a full time working employee, Ms. JingWen Chen. With the active call of a member company, we also invited Kingfisher, the world's leading building materials home retail group to join as an associate member, who widens the member scope.

During 2019, pinfa China participated in the National Flame Retardant Academic Conference as an important sponsor and held a pinfa China quarterly meetings. Most recently, with ambitious targets to provide all industries with halogen-free phosphorus, inorganic and nitrogen series flame retardant solutions and technical support, and promote the fire safety of 5G in E&E applications, pinfa China hosted an E&E 5G technology workshop on November 21, 2019. They invited industry leaders from 5G-related industries to share and discuss this hot topic, such as material requirements of 5G, the connection between 5G technology and new devices, the development trend of E&E products in the next five years. In 2020, all members will promote pinfa China to the FR related value chain. It is expected that pinfa China members could cover different areas of the supply chain in the future. In addition, on February 12, 2020, we expect that pinfa members will work with CPCIF Flame retardant department in Beijing to have a closer communication with relevant government functional departments.

It is also in plan to hold volunteer activities to popularize fire retardance basic knowledge, chose the city landmark buildings (e.g. Shanghai tower) for FR knowledge education, to give more people the safety and awareness of halogen-free flame retardants.

PIPELINE FOR 2020

2019 saw pinfa EU turn 10 years old, and while the past decade has delivered many achievements, the forthcoming one shall see even more challenges on the horizon.

First of all, circular economy and dealing with plastic waste are now a top political priority at European level, meaning that recycling of polymers containing flame retardants should be looked at even more carefully. pinfa has already supported or led several initiatives to improve sorting and recyclability of FRed plastics, but our future depends on improving the sustainability of products and pinfa is committed to improve the recyclability of its formulations. We plan on continuing the work started with Fraunhofer LBF and AIMPLAS in 2020.

Second, Fire Safety needs to stand out as a priority for European policy agenda, and pinfa will support initiatives making Fire Safety a more horizontal topic shaping the future of our policies. Since the launch of a joint IAFSS meeting in December 2018, pinfa has been actively promoting more coordination between the many stakeholders of the Fire Safety ecosystem. With a new Commission in town, 2020 will offer many opportunities to create a momentum on this issue. Fire Safety Science, Fire Information Statistics, Firefighter practice and so many more topics could benefit from greater European collaboration.

Last but not least, pinfa also aims at improving its outreach in 2020, making available more educational resources on PIN Flame retardants, with the development of a toolkit for public use. This toolkit should be used as a public source of information on PIN Flame Retardants, their mode of action, their sustainability profile, their possible applications and their availability.

On top of these three horizontal priorities, pinfa EU will keep supporting its ongoing projects, as listed under the Section 2 of this report.



RECYCLING & CIRCULAR ECONOMY

Sustainability has always been part of pinfa's DNA, but as 2020 comes, circular economy and recycling of plastics have become closer to market, enabling even better life cycles for the products containing PIN flame retardants. pinfa will continue its recycling work with leading European institutes.



FIRE SAFETY AS AN EU PRIORITY

There is only one fire safety science, but the fight against fire risks is spread thin across our 28 EU member states and so are the resources. pinfa supports a greater European role for the promotion of safe, efficient and environmental-friendly fire safety solutions.



PINFA ACADEMY

pinfa supports transparency and availability of educational resources on flame retardants. In 2020, pinfa will share a toolkit on PIN flame retardants for external use, and keep on updating the brochures available E&E, Transport and Building & Construction applications.

MEET THE TEAM



Dr Adrian Beard
Chairman of pinfa

Adrian Beard works for Clariant Corporation, Hurth near Cologne in Germany, as Head of Marketing and Advocacy for the Flame Retardants Business Line of the Business Unit Additives. On top of his Clariant position, Adrian has been the Chairman of pinfa since November 2016.

He is also a senior expert in fire safety and environmental properties of phosphorus based flame retardants. From 1991 to 1999, before joining Clariant, he was head of the environmental analytical laboratory at the Fraunhofer-Institute for Environmental, Safety, and Energy Technology in Oberhausen, Germany. He holds a doctorate in analytical chemistry from the University of Waterloo, Ontario, Canada and a diploma in geo-ecology from the University of Bayreuth, Germany.

Jonathan Crozier
Sector Group Manager of pinfa

Jonathan is a sector group manager for the Specialty Chemicals department of Cefic, the European Chemistry Council. Since February 2018, Jonathan has been in charge of pinfa, reporting directly to the executive committee. Jonathan's role includes coordination of the advocacy strategy, supervision of the members relationship and management of the projects undertaken by pinfa.

Between 2010 and 2017, Jonathan worked in Brussels' European bubble, in Public affairs and Communications positions. A political scientist by training, Jonathan has 8 years of experience in EU affairs and a Masters in European Public Affairs from Sciences Po Grenoble, France.



Hannane Haddouch
Assistant of pinfa

Hannane Haddouch is a sector group assistant for the Specialty Chemicals department of Cefic.

Since 2011, she provides administrative support to the Secretary General and the pinfa members.



Chris Thornton
Consultant to pinfa
Communications

Chris Thornton writes the pinfa Newsletter, which provides monthly information on PIN flame retardants and fire safety. He has been working with the flame retardants industry in Europe since 2001 on information and Newsletter communications, fire safety, life cycle analysis, eco-labels, smoke toxicity and other flame retardant environment and health challenges. He is British born, now living in France. His other activities include sustainable management and recycling of phosphorus.

MEMBERSHIP

FULL MEMBERS

PRODUCERS OF PIN FLAME RETARDANTS



FULL MEMBER

Any producer of Phosphorus, Inorganic and Nitrogen flame retardant chemicals shall be eligible for membership. The membership includes a company's subsidiaries and joint ventures.

ASSOCIATE MEMBER

Associate membership is open to other related technologies, e.g. FR synergists or companies using Phosphorus, Inorganic and Nitrogen flame retardant chemicals (i.e. formulators, blenders, distributors, agents, end users, etc.).

ASSOCIATE MEMBERS

USERS OF PIN FLAME RETARDANTS



MUTUAL MEMBERSHIPS



pinfa is open to all companies producing or using PIN flame retardants, as full or associate Members respectively.

For further information please contact: pinfa@cefic.be



pinfa
Phosphorus, Inorganic & Nitrogen Flame Retardants Association

A sector group of
 **cefic**

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