

North America workshops on polymers, transports	1	Fire leads Beijing to oust migrants and demolish homes	5
How to promote fire safety R&D in EU policies?	2	PIN FR cables for demanding applications	5
EU Consultation on FP9: input to underline fire safety	2	LSF is not LSHF	5
EU Construction Products Regulation consultation	2	PIN FR micro-ducts for cable protection	6
Study for EU on regulating smoke toxicity	2	Scott Bader PIN FR coatings achieve rail standards	6
New PINFA member: TOLSA	3	Textile brands action on hazardous chemicals	6
Media controversy over child car seat burn incident	3	Innovations in non halogen flame retardants at FRPM	7
Compounding world: growth and sustainability	4	Hewlett Packard: substitution of halogenated FRs	7
Online training on low hazard, low smoke PIN FRs	3	Other News	7
PIN FR 3D-printing polymer	4		

The coming months will see important discussions as to whether fire safety research will be an EU priority in the coming decade. The EU has begun the process of defining the 9<sup>th</sup> R&D Funding Programme (FP9, which will follow Horizon 2020) with probably around 100 billion € funding. Stakeholders can already input to the **EU public consultation on F9 missions open to 3<sup>rd</sup> April**. This consultation is open to the public, companies and other organisations at <https://ec.europa.eu/eusurvey/runner/482a79de-3fad-17e1-c60d-2e4418c1a95d> pinfa will input underlining the need for research into fire safety, proposing a mission on “fire safety in a sustainable, inclusive society”. In parallel to ongoing development of innovative fire safety solutions by companies, in particular PIN flame retardants, public research is also important to support innovation and to address key societal questions, in particular where fire safety intersects with social cohesion and sustainability. Fire safety is closely linked to sustainability, because it is critical in thermal insulation (including with bio-based or recycled materials), for urban densification, and in applications of performance polymers in electronic miniaturisation and transports (energy saving) and renewable energy ...). This is confirmed in the report just published by the European Commission on smoke toxicity of construction materials (see below), which concludes the need for more data and research. Fire safety is important for social inclusion, because those most at risk from fire are the elderly and handicapped and populations in difficulty, as demonstrated by fires in temporary housing (Paris ‘hotel’ fires) or social housing (including the Grenfell Tower tragedy). pinfa proposes to researchers and stakeholders to take forward dialogue on research needs for fire safety and on how to possibly include fire safety in the EU’s FP9 R&D programme. We propose a **workshop at the Nordic Fire Safety Days Trondheim, 7<sup>th</sup>-8<sup>th</sup> June**, or invite you directly contact [pinfa](mailto:pinfa@pinfa.org).

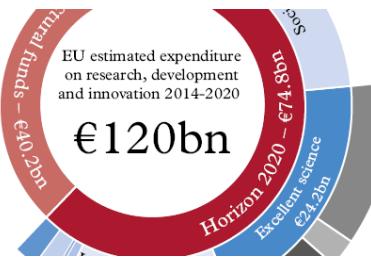


Trends and technical developments in the international flame retardant industry

## North America workshops on polymers, transports

pinfa North America is organising three workshops and panels on PIN flame retardants in specific applications. 4<sup>th</sup>-5<sup>th</sup> April, a 2-day workshop on “Changing Material Flammability Requirements for Ground Transportation” is organised together with SAMPE, the Society for the Advancement of Material and Process Engineering (details <http://www.pinfa-na.org/>). On April 10-11 a specialist panel on PIN flame retardants selection and application is organised within the AMI Flame Retardants in Plastics conference, Pittsburgh, Pennsylvania. On May 10<sup>th</sup> within the week-long ANTEC/NPE conferences (US Society of Plastics Engineers and National Plastics Exposition), Orlando, Florida, a specialist session will address “non-halogen flame retardants”, particularly in construction and insulation materials and flame retardancy from USA and Europe.

ANTEC, 7-11 May 2018, Orlando <https://www.eiseverywhere.com/ehome/252707>  
pinfa and pinfa North America events: <http://www.pinfa.eu/index.php/en/media-events/events> and <http://www.pinfa-na.org/>



## How to promote fire safety R&D in EU policies?

pinfa proposes dialogue on promoting the inclusion of fire safety in FP9, the EU's R&D funding Framework Programme which will follow Horizon 2020 (see Editorial of this Newsletter). What fire safety challenges need research? How to include fire safety in FP9 missions such as social inclusion, security or sustainability? How to support inclusion of fire safety in FP9?

*Workshop at the [Nordic Fire Safety Days](#) (NFSD) Trondheim, Norway, 7<sup>th</sup>-8<sup>th</sup> June, or to take this forward through other channels contact [pinfa@cefic.be](mailto:pinfa@cefic.be) or NFSD [anne.dederichs@ri.se](mailto:anne.dederichs@ri.se)*

## EU Consultation on FP9: input to underline fire safety

The European Union has opened a public consultation on "missions" in FP9 (the European R&D Funding Programme which will follow Horizon 2020) **open to 3rd April**. pinfa will input, underlining that fire safety is critical for sustainability (building insulation and reduced ventilation, renewable materials, urban densification, biopolymers, clean energy and mobility, connected products) and for social inclusion: (social housing, and the elderly are particularly at risk from fire). pinfa will propose a mission on "fire safety in a sustainable, inclusive society, to develop reliable EU fire statistics and safety audits and support R&D on fire prevention and fire safety, with the aim to reduce fire deaths by 20% and fire-risk housing by 80%.

*Public consultation, open to open to the public, companies and other organisations, until 3<sup>d</sup> April 2018 at: <https://ec.europa.eu/eusurvey/runner/482a79de-3fad-17e1-c60d-2e4418c1a95d>*

## EU Construction Products Regulation consultation

The European Commission has launched a public consultation (open to all citizens, companies and organisations, based on a short questionnaire) on options for updating the EU Construction Products Regulation (305/2011). This follows the consultation of stakeholders already organized in 2017 (see pinfa response in pinfa Newsletter n°84). The consultation presentation and online questionnaire refer to construction products' safety and environmental impact, but fire and smoke are not mentioned. The consultation seems to target single market, trade and regulatory issues, but the online questionnaire does allow respondents to indicate the importance of e.g. product performance, safety, environment, insulation. This consultation is **open online to 16<sup>th</sup> April 2018**.

*European Commission "Public consultation on EU rules for products used in the construction of buildings and infrastructure works", online questionnaire and possibility to submit documents or position paper (max 1 MB) [https://ec.europa.eu/info/consultations/public-consultation-eu-rules-products-used-construction-buildings-and-infrastructure-works\\_en](https://ec.europa.eu/info/consultations/public-consultation-eu-rules-products-used-construction-buildings-and-infrastructure-works_en) Open to all citizens, companies and organisations to 16 April 2018.*

## Study for EU on regulating smoke toxicity

The European Commission has published the study commissioned by DG GROW in 2016 to evaluate the need to regulate on toxicity of smoke generated by construction products in fires, within the framework of the EU Construction Products Directive (CPR). The report is based on analysis of 175 publications (literature review) as well as documents provided by stakeholders, and interviews of 17 European organisations (including pinfa). Seven Member States are stated to already have some form of regulation on smoke toxicity of construction products, including



Belgium, France, Lithuania, Poland and Sweden. The study concludes (p98) that it has not identified clear evidence that building fire victims are killed by toxic smoke from construction products. In fires where fatalities can be attributed to toxic gases, these are mainly CO, CO<sub>2</sub> and HCN and their origin cannot be linked to construction products (rather than furnishings and fittings). The report states (p. 24) "Published data overwhelmingly show that flame retardants do not contribute significantly to either acute or chronic fire toxicity in real fires", but on the other hand indicates that synthetic materials produce up to twelve times more smoke particles than natural materials (based on one study). The report concludes that:

- smoke toxicity regulation would increase the cost of construction materials and possibly exclude some materials from the market;
- more research, better fire statistics and clearer definitions are needed (including for fire engineering); underlines the problem of smoke in escape routes or safe zones;
- there is no agreement on the need for smoke toxicity regulation for building products, any such regulation should be supported by cost-benefit analysis, but if legislation were enacted it should be so at the EU level;
- smoke toxicity regulation should possibly address not only building materials but also furnishings and fittings and should take into account alternative fire safety approaches.

*"Study to evaluate the need to regulate within the Framework of Regulation (EU) 305/2011 on the toxicity of smoke produced by construction products in fires. Final Report", T. Yates, BRE / Ecorys, VITO for the European Commission DG GROW, October 2017 (published January 2018) [http://ec.europa.eu/growth/sectors/construction/support-tools-studies\\_nl](http://ec.europa.eu/growth/sectors/construction/support-tools-studies_nl)*

## Online training on low hazard, low smoke PIN FRs

The screenshot shows the OnlyTrainings website with a navigation bar including 'HOME', 'ABOUT US', 'UPCOMING ONLINE TRAININGS', 'ACCESS ON DEMAND TRAININGS', and 'EXPRESS'. Below the navigation is a search bar and an email link 'trainings@onlytrainings.com'. A main banner features the course title 'Formulate Halogen-Free Flame Retardant, Low Hazard & Low Smoke Polymer Compounds'. To the right of the banner is a small image of a firefighter. Below the banner, a text box explains the course content: 'With the increased demand for safety and health hazards, companies are now developing materials that are non-hazardous, safe and flame retardant. It is now understood that smoke and flame retardants can be a greater risk to health than that of fire alone. This training focuses on how to formulate a low hazard, safe and halogen free flame retardant plastic material compounds.' At the bottom left, it says 'At the same time it gives an overview on the'.

A 90-minute specialist training session online on formulating halogen-free, low hazard, low smoke polymer compounds provides an overview of PIN FRs and fillers available today, including mode of action and safety profile, and design of non-halogenated FR compounds. In particular, applications in cables are considered, including PIN FR polyolefins and use of mineral PIN FRs (such as ATH). The training is delivered by Francesco Vallorini, flame retardant specialist at Alfavinil SA.

*OnlyTrainings "Formulate Halogen-Free Flame Retardant, Low Hazard & Low Smoke Polymer Compounds", 90 minutes, first online 19<sup>th</sup> December 2017, available now (paying access) <https://onlytrainings.com/Formulate-halogen-free-flame-retardant-low-hazard-low-smoke-polymer-compounds>*

## Media controversy over child car seat burn incident

A Texas mother posted online photos of a burnt car seat, claiming that she was taking her daughter out of the seat on parking when she saw smoke coming from it. She indicated that the incident, which left burn holes in the seat fabric, had been started by sun in a mirror placed on the rear seat to enable her to see the child whilst driving. Media have however asked why she did not use a specific safety mirror placed near the roof (less likely to catch the sun). Although media refer to a "fire" it seems the seat did not in fact catch fire, but it is not clear whether this is because it was resistant or because the mother intervened in time.

*"Horrified mother shares a panicked warning with other parents after her child's car seat caught FIRE in the sun ..." Daily Mail 30/1/18 <http://www.dailymail.co.uk/femail/article-5331219/Mother-shares-warning-babys-car-seatcatches-fire.html>*





## New PINFA member: TOLSA

TOLSA is a global leading supplier of flame retardant synergist additives for wire & cable, construction, transport and E/E applications; with over 60 years of experience in multiple industrial markets. TOLSA's technology retards fire development and propagation in polymer systems, reducing smoke emissions. TOLSA's products act in synergy with most PIN flame retardants improving the char formation during combustion, which protects the polymer from fire. All these benefits are achieved by tailoring natural silicates with a specific morphology, which is beneficial in combination with PIN flame retardants. Moreover, due to their special morphology these additives improve significantly the anti-dripping effect. pinfa membership will enable TOLSA to participate in joint pinfa actions understanding the functioning and potential of PIN flame retardants and synergists, in particular developing PIN fire safety systems which offer lower health and environment impacts and which contribute to lower smoke emissions in case of fire.

Link: <http://www.tolsa.com/adins/>

DECEMBER 2017 ISSN 2053-7174

## Compounding WORLD

### Growing FR market trends to sustainable solutions

Demand for fire retardants continues to grow, driven in large part by the increasing use of automotive electronics, but formulators are seeking sustainable solutions, writes Peter Mapleston

## Compounding world: growth and sustainability

'Compounding World' magazine's annual feature article on flame retardants in plastics concludes that the market is continuing to grow, driven particularly by increasing electronics and electronic drive systems in automobiles, and that there is a strong development of sustainable solutions. Electronics manufacturers, for example, are increasingly looking for "eco-friendly" and regulation approved materials, leading to select PIN FRs. Interviewees in industry estimated expected market growth for flame retardants at 3 – 5 % per year. Sustainability trends include development of larger molecule FRs, less susceptible to migrate out of products, and underlying trends to move to non-halogenated FRs. Other drivers discussed are the need for easy processing and PIN FR-polymer compounds able to deliver advantages such as mechanical performance or chemical resistance. Company interviews presented are: Clariant, Budenheim, FRX Polymers, ICL, Lanxess, Adeka, Paxymer, Dow Corning, Fraunhofer LBF, Rio Tinto, Kyowa Chemical, Huber Martinswerk, Nabaltec, LKAB Minerals.

"Growing FR market trends to sustainable solutions", Peter Mapleston, Compounding World, December 2017, 7 pages, ISSN 2053-7174 [www.compoundingworld.com](http://www.compoundingworld.com)



## PIN FR 3D-printing polymer

Shenzhen Esun Ind. Co. has launched a PIN flame retardant ABS-based 3D-printing filament, eSUN eABS "MAX halogen-free", offering a 3D print temperature of 220-260°C and print feed rate of 30-90 mm/s. The material offers stability, toughness, good melt mobility and smooth printing, scratch resistance and can be polished. It is presented as fully recyclable. Established in 2002, ESUN has three research centres and develops and produces a range of polymers, in particular degradable materials such as PLA and Polymorph. ESUN supplies leading 3D-printer manufacturers and suppliers worldwide.

"New eSUN eABS MAX For 3D Printing is Halogen-Free & Flame Retardant", June 2017  
<http://www.esun3d.net/News/945.html>



## Fire leads Beijing to oust migrants and demolish homes

Media are reporting that thousands of migrants have been forced out of slum housing areas in the Beijing suburbs, following a fire in Xinjiang Village, Daxing District. The fire concerned a two-storey apartment building housing 300 people and lead to 19 deaths. Following the fire, Beijing City launched a city-wide fire conformity check, particularly targeting suburb shanty towns where migrants are concentrated, with media reporting that this has led to forced eviction of tens of thousands of mainly migrant workers and their families, enforced by armed guards and reportedly in some cases with violent demolition of shops and homes. This tragedy and authorities' action illustrate the links between fire safety and social inclusion.

Reuters 28 November 2017 <https://www.reuters.com/article/us-china-fire/backlash-as-beijing-fire-safety-blitz-forces-exodus-of-citys-underclass-idUSKBN1DS08B>

## PIN FR cables for demanding applications

Italian specialist compounder Fainplast, Italy, is extending its range of high performance non halogenated flame retardant compounds, with crosslinkable HFX compounds, using the Sioplas (XLPOHFFR) method, adapted to demanding applications such as solar panels. The HFX range are polyolefin based and adapted to production of crosslinked insulation or sheathing, without use of specific curing equipment, and offer EN 50363 M2 fire performance. The company's HAF range of PIN FR compounds, using mineral fillers, offer EN 50363 M1 fire performance with low smoke emission and are available in grades with high crack resistance, high flexibility and bending resistance, low temperature application. Fainplast began developing performance thermoplastic compounds for cables in Assisi in 1993, and PIN compounds since 2001.

"Industry News. FAINPLAST Opens Halogen-free Flame Retardant Production Line", SpecialChem, 23<sup>rd</sup> August 2017 <http://polymer-additives.specialchem.com/news/industry-news/halogenfree-flame-retardant-fainplast-000188371> and FAINPLAST [www.fainplast.com](http://www.fainplast.com)



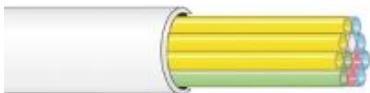
## LSF is not LSHF

The UK specialist in lighting connection products, Flex Connectors, explains why LSF (Low Smoke and Fume) and LSHF (Low Smoke Halogen Free) are different, and offer different safety factors in case of fire. The company indicates that LSF is an imprecise label, and that cables can contain materials which emit dense smoke in case of fire as well as acidic gases. LSHF cables, as defined by BS 50525-3-11, on the other hand produce reduced smoke in case of fire, so less reducing visibility and escape. These cables should respect EN 50267-2-1 which stipulates that HCl emissions must be < 0.5% and EN 60684-2 which stipulates that visibility must not be reduced by more than 40%. Flex Connectors offers a range of lighting power and control cables and connection boxes which are LSHF to BS 50525-3-11 in the modular Flex7 range.

"LSF vs LSHF – Do you know the difference?", <https://www.flexconnectors.co.uk/laf-vs-lshf-do-you-know-the-difference/>

BS EN 50525-3-11:2011 = "Electric cables. Low voltage energy cables of rated voltages up to and including 450/750 V (U0/U). Cables with special fire performance. Flexible cables with halogen-free thermoplastic insulation, and low emission of smoke" <http://shop.bsigroup.com/ProductDetail/?pid=00000000030188834>

## PIN FR micro-ducts for cable protection



Hexatronic, Swedish specialist in optical fibre communication systems, offers a range of 'halogen-free flame retardant' microducts for cable installation in buildings. Insulating, low friction internal surfaces ensure installation without cable damage and optimal protection of fibre optic cable systems. Ducts are available from 3/2 (slim) to 12/10 mm, and are rated IEC 60332-3-24 or UL 1666 OFNR or UL Riser.

*Hexatronic Cables & Interconnect Systems "Microducts for indoor installations"*  
<http://hexatronic.com/products/microducts-and-microduct-assemblies/microducts-for-indoor-installations/>



## Scott Bader PIN FR coatings achieve rail standards

The global chemical company Scott Bader is owned by its own employees, under a unique charity trustee status. The company's range includes innovative Phosphorous, Inorganic, Nitrogen flame retardant solutions. Crystic® Fireguard 70PA is a spray gelcoat for applications demanding low flame spread fire safety and low smoke emissions, as well as UV weathering. Tested with Scott Bader's PIN FR (ATH) filled Crestapol® 1212 resin, as a glass fibre mat reinforced laminate, HL2 pass rating was achieved under the EN 45545 European railway standard. This enables railway-standard components to be manufactured cost-effectively by closed moulding and pultrusion. Halogen-free Crystic® U1131 TPA polyester resin offers low toxicity and low density smoke emission, and fully cured laminates produced with PIN gelcoat Crystic 72PA are classified M2 and F1 according to the French fire safety Standard and have also passed ASTM E162, E662 and BSS 7239.

[www.scottbader.com](http://www.scottbader.com)



**Leading the textile, leather and footwear industries towards zero discharge of hazardous chemicals**

## Textile brands action on hazardous chemicals

Further companies have joined the apparel brands coalition to avoid emissions of hazardous chemicals in textile and synthetic leather processing: ZDHC (Zero Discharge of Hazardous Chemicals). The coalition now has 70 participating clothing and textile companies, up from 22 in 2016 (see pinfa Newsletter n°68), including names such as Nike, Levi Strauss, Esprit, Gap, Burberry, Adidas, Primark, Betton, Puma, C&A, H&M, Marks & Spencers ... The ZDHC excludes the use of chemicals on a MRSL (Manufacturing Restricted Substances List), which includes a number<sup>1</sup> of chlorinated and brominated FRs and TEPA<sup>2</sup>.

(1=) Listed halogenated FRs include: TCEP, Deca and other BDEs, TBBPA TDCP, BBMP, BIS and TRIS, HBCDD and SCCPs.(2) TEPA = Tris(1-aziridinyl)phosphine oxide - which is already restricted under REACH for use in textiles with skin contact (Annex XVII)

ZDHC: <http://www.roadmaptozero.com/> and new members 18/10/2017  
<http://www.roadmaptozero.com/news/post/zdhc-joins-forces-with-five-new-organisations-committed-as-zdhc-contributors/> and MRSL list  
<http://www.roadmaptozero.com/programme/manufacturing-restricted-substances-list-mrsl-conformity-guidance/>



## Innovations in non halogen flame retardants at FRPM

The FRPM (Flame Retardant Polymeric Materials), every two years, brings together four days of front-edge research into flame retardants, fire behaviour of polymers and fire testing. FRPM 2017, 2-6 July, Manchester UK, showed 110 presentations and posters, many of which addressed innovation in PIN FRs, and only three of which addressed halogenated flame retardants, giving a strong indication of the direction future flame retardant technologies are headed. PIN flame retardant chemistries explored included phosphorus based (e.g. DOPO, phosphaphenanthrenes, combinations of phosphorus with bio-based compounds), sulfenamides, oxyimides, nano-carbons, double layered hydroxides, magnesium dehydrate, tannic acid, lignin, melamine, organo-metals, clays, non-edible plant oils ... uses of flame retardants in many different polymers were addressed, including cotton and textiles, polyamide, epoxy resins, polypropylene, polyethylene, polyacrylonitrile, poly(butylene succinate), polystyrene, PET, bio-based polymers, including applications such as aircraft, marine, insulation foams, electronics.

16<sup>th</sup> FRPM (2017) Fire Retardant Polymeric Materials and Fire Chemistry research conference  
<https://www.frpm17.com/>



## Hewlett Packard: substitution of halogenated FRs

At [FRPM 2017](#), Hewlett Packard (HP) summarised the IT industry view on flame retardants, noting that most major IT brands have now largely eliminated PVC and halogenated flame retardants from their products, including progressively printed circuit boards. In order to avoid substituting with problematic chemicals, HP uses [Green Screen™](#) and has to date assessed 160 substitutes using this safer chemicals methodology, so generating a positive list of recommended substances which is available to all HP suppliers. HP has also been working with different EcoLabel schemes, and in 2015 the Swedish TCO Ecolabel adopted Green Screen™ (see pinfa Newsletter n°54) and included a list of PIN flame retardants assessed as Benchmark 2 or better which are accepted in TCO certified products.

"The IT industry view on flame retardants", Nuno Santos and Hans Wendschlag of Hewlett Packard at FRPM 2017, July 2017 <https://www.frpm17.com/>



## Other News

**California priority chemicals in products:** the California the Department of Toxic Substances Control (DTSC) has published its (draft) three-year work plan on "Priority Products". This identifies chemicals (identified per product group) posing questions of potential harm and requiring manufacturers to assess safer alternatives. The work plan includes chlorinated, brominated and organophosphate flame retardants in household, school and workplace furnishings and décor, the same in building products (construction and renovation).

CALSafer "Draft Three Year Priority Product Work Plan (2018-2020)", February 2018  
<http://www.dtsc.ca.gov/SCP/PriorityProductWorkPlan.cfm>

**RDP added to ECHA CORAP list:** ECHA The European Chemicals Agency (ECHA) has added the PIN flame retardant RDP = Tetraphenyl resorcinol bis(diphenylphosphate), EC#- 260-830-6, CAS 57583-54-7 to the DRAFT CoRAP list (Community Rolling Action Plan, update 2018-2020). This list “contains substances suspected of posing a risk to human health or the environment” and which are proposed for evaluation. The draft list now contains 107 chemicals.

The CORAP list now includes the following flame retardants/synergists:

- 2,2-dimethylpropan-1-ol, tribromo derivative EC# 253-057-0
- 2,2,6,6-tetrabromo-4,4-isopropylidenediphenol EC# 926-564-6
- 1,1'-(isopropylidene)bis[3,5-dibromo-4-(2,3-dibromoproxy)benzene] EC# 244-617-5
- 1,1'-(isopropylidene)bis[3,5-dibromo-4-(2,3-dibromo-2-methylpropoxy)benzene] EC# 306-832-3
- 1,1'-(ethane-1,2-diy)bis[pentabromobenzene] EC# 284-366-9
- Tris[2-chloro-1-(chloromethyl)ethyl] phosphate (TDPP) EC# 237-159-2
- N,N'-ethylenebis(3,4,5,6-tetrabromophthalimide) EC# 251-118-6
- Tris(2-chloro-1-methylethyl) phosphate (TCPP) EC# 911-815-4
- Diantimony trioxide EC# 215-175-0
- bis(2-ethylhexyl) tetrabromophthalate EC# 247-426-5
- Triphenyl phosphite EC# 202-908-4
- Triphenyl phosphate EC# 204-112-2
- Tributyl phosphate EC# 204-800-2
- Trixylyl phosphate EC# 246-677-8
- Tris(methylphenyl) phosphate EC# 809-930-9
- 2,4,6-tribromophenol EC# 204-278-6
- C14-C17 chloro alkanes (MCCP) EC# 287-477-0

ECHA Draft Community Rolling Action Plan (CoRAP) <https://echa.europa.eu/fr/information-on-chemicals/evaluation/community-rolling-action-plan/draft-corap> and full list <https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table>

## 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)