

Your newsletter for non-halogen fire safety solutions No. 75 February 2017

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Upcoming events

- 23 February, Milan, TMP – pinfa [workshop](#): fire safety of E&E polymers and PIN flame retardants
- 25-26 April, Pittsburgh PA, USA , **AMI Fire Retardants in Plastics 2017**
- 25-27 Sept., Ypsilanti, MI, USA, **pinfa NA 5th annual workshop**: Fire Safety Requirements in Automotive Design

For full events listing, see www.pinfa.eu

Debate continues as to what, if any, level of fire safety should be required by regulation in upholstered furniture for private homes. Whilst there is general agreement that fire safety is necessary for furniture in public or high-risk places (theatres and stadiums, trains, planes, ships and cars, hospitals ...), some organisations oppose fire safety requirements for domestic furniture. This led to the lowering of safety standards in California in 2013 (TB117 modified from small flame to smouldering cigarette only). On the one hand, evidence confirms that domestic furniture is a major contributor to home fires, deaths and injuries (see US CPSC data below) and that stringent fire safety requirements reduce these losses (see UK data, [pinfa Newsletter n°36](#)). On the other hand, furniture industry lobbying (see EFIC below) aims to reduce costs and testing obligations (despite these costs being lower than savings resulting from reduced fire losses, see US CPSC below) and there are questions as to whether flame retardant use is justified in home furniture (see e.g. ANSES report, [pinfa Newsletter n° 57](#)). A difficulty is that furniture fire resistance is particularly important for at-risk populations, such as small children or the elderly. pinfa suggests that fire safety should not be sacrificed, but that regulation should ensure that, as for all chemicals, only flame retardants with better environment and health profiles should be used.

Smouldering cigarette test for furniture not effective

The US Consumer Product Safety Commission has published a 65 page [report](#) concluding against federal adoption of the California TB117-2013 ‘smolder resistance’ test. The report concludes that this test “does not address the hazard of smoldering ignition” for upholstered furniture, and that a small flame test would also be inadequate because of the variability of furniture textiles and foams. Benefits of a US mandatory smoldering resistance requirement for furniture are considered limited because 90% of furniture is already today conform. The report indicates that in the USA some 4 700 fires, 390 deaths, 660 injuries and US\$238 million property damage are attributable to fires where upholstered furniture is the first item ignited. This does not take into account impacts of fires igniting in other items and then spreading through furniture. CPSC concludes that a US mandatory small flame test (NPR) would bring fire safety benefits of around US\$420 million/year, compared to costs to the furniture industry of only \$32-357 million, but that the benefits cannot be confirmed without validation of bench-scale tests. The report indicates that, to date, it is not clear whether the change in California furniture fire regulation (from small flame to smoldering cigarette resistance) has modified use of flame retardants. The report includes a “Health Science Review” ([TAB C](#): dated 5/8/2016) assessing flame retardant chemicals. This concludes that the health effects of flame retardants “concern CPSC staff” but that assessment has shown that “some FRs could be used without presenting hazards to consumers”*. Finally, CPSC concludes to recommend no further development of federal smoldering or small flame tests for furniture.

CPSC (US Consumer Product Safety Commission) Staff Briefing Package “The Feasibility, Benefits and Costs of Adopting TB 117-2013 as a Mandatory National Standard”, September 8th, 2016 <https://www.cpsc.gov/s3fs-public/The%20Feasibility%20Benefits%20and%20Costs%20of%20Adopting%20-TB117-2013%20-%20September%208%202016.pdf>

** CPSC indicate as not presenting hazard to consumers: Melamine, Cyclic phosphonate esters (CPE), Decabromodiphenyl oxide (DBDPO), 2-Ethylhexyl diphenyl phosphate (EHDP), Hexabromocyclododecane (HBCD), and Phosphonic acid, (3-([hydroxymethyl]amino)-3-oxopropyl)-, dimethyl ester (PA) but as potentially problematic or lacking data: Antimony Trioxide (AT), Tris(1,3-dichloro-2-propyl)phosphate (TDCPP), and Tetrakis(hydroxymethyl) phosphonium chloride (THPC), Firemaster-550™.*

Furniture industry lobbying against fire safety

The European Furniture Industries Confederation has organised a meeting and launched a petition against the use of flame retardants in furniture. The industry confederation argues that furniture fire safety regulations differing between EU Member States “prevent the free circulation of goods and reduce competition, giving preference to local producers.” The furniture industry document claims that flame retardants increase costs, pose quality problems and hinder recycling. The industry confederation’s petition points to issues with certain flame retardants, with a mixture of facts (some are POPs) and hypotheses (some FRs suggested to be endocrine disruptors, dioxins in firefighters blood), fails to take account of differences between flame retardants, and then goes on to demand that all flame retardants in furniture be abandoned claiming that “fire safety is achievable without the use of flame retardants.” The measures cited are smoke detectors, public information campaigns and verification of electrical installations, all measures pinfa fully supports and which



are important in parallel to ensuring fire safety of materials and building contents. The document however makes no proposals as to how the furniture industry proposes to address furniture fire safety without flame retardants, for example by requiring inherently fire resistant textiles for furniture coverings (e.g. leather, thick wool, aramide ...) or physical barriers underneath covering textiles to prevent ignition of foam cushioning. The document also fails to distinguish between domestic furniture where such measures may be sufficient and furniture in public places, transport, institutions, where strict fire safety requirements are essential.

“Building a Strategy to Abandon the Use of Hazardous Flame Retardants in Furniture and Mattresses in Europe”, 28th April 2016 www.efic.eu



CalSAFER draft guide on alternatives analysis

California’s State Safer Consumer Products Information Management System (CalSAFER) has published for [consultation](#) (closed 20th January 2017) a “Draft Alternatives Analysis Guide” which aims to help organisations identify alternative approaches to fulfil the State’s regulatory safety requirements for consumer products. Pinfa has submitted comments underlining that fire safety is an important product performance criteria in certain products, concerning not only flammability but also smoke emission and toxicity. Pinfa also comments that the current wording of the document suggests, wrongly, that all flame retardants are “hazardous”, and specifies a number of PIN FRs which are not classified “hazardous” under GHS.

CalSAFER “Draft Alternatives Analysis Guide” (draft for consultation)
<http://www.dtsc.ca.gov/SCP/upload/Draft-Alternatives-Analysis-Guide.pdf>



Samsung recalls a million Galaxy fire-risk phones

Samsung has recalled over one million Galaxy Note7 smartphones sold in the USA and over 20 000 sold in Canada. The company has received, from the USA alone, nearly 100 reports of batteries overheating, 26 of burn injuries and 55 of property damage including fires in cars and buildings. Samsung is asking all US purchasers of Note7 phones to power down the device and send it to the company for either refund or exchange for a different model. See also [pinfa Newsletter n°72](#) “Galaxy Note7 banned by airlines”.

Galaxy Note7 recall, US CPSC 15/9/2016 <https://www.cpsc.gov/Recalls/2016/Samsung-Recalls-Galaxy-Note7-Smartphones/> and Samsung expanded recall updated 9/12/2016 <http://www.samsung.com/us/note7recall/>



Nexans flexible automation cables

Global specialist cable company Nexans (see pinfa Newsletter n°s 43, 56, 61) has launched a new range of non-halogenated flexible automation cables for industrial applications. The MOTIONLINE® HALEX cables provide cost-effective, robust, flexible (small bend radii > 2 million cycles @ 10xD), drag-chain capable cables, which are abrasion, oil and cooling lubricant resistant. Their non-halogenated flame retardant formulation ensures that the release of toxic or irritant gases is minimised in case of fire. They are adapted to sensor, servo, bus, Industrial Ethernet, energy and control transmission in drag-chain automated equipment. Nexans employs 26 000

people in 40 countries worldwide, providing specialist cables in particular to power, energy, transport and construction markets, with an emphasis on low environmental impact. Nexans is a signatory of the Europacable Industry [Charter](#) committing to development of ethical, sustainable and high-quality cables.

“Nexans launches PVC-free Motionline® HALEX automation cables”, 22 Nov. 2016
<http://www.nexans.fr/eservice/navigation/NavigationPublicationOnly.nx?publicationId=-35442#>

Phosphorus – nitrogen – sulphur FR for epoxy

A new flame retardant molecule was experimentally developed based on the organo-phosphorus compound DOPO (9,10-dihydro-9-oxy-10-phosphaphenanthrene-10-oxide), which is increasingly being tested as a basis for new PIN flame retardants, and 2-aminobenthothiazole (ABZ), a nitrogen and sulphur containing molecule. The resulting DOPO-ABZ was tested as a PIN FR in epoxy resin, achieving 30-35% reduction in peak heat release and UL94-V0 at 7.5% loading. The flame retardant mechanism of the DOPO-ABZ is considered to be principally in the gas phase, with release of ammonia, and sulphur containing compounds and phosphorus free radicals above around 380°C. The PIN FR also significantly reduces smoke release.

“Synthesis of a Novel P/N/S-Containing Flame Retardant and Its Application in Epoxy Resin: Thermal Property, Flame Retardance, and Pyrolysis Behavior”, R. Jian et al., I&EC Research, 55, 11520-11527 <http://dx.doi.org/10.1021/acs.iecr.6b03416>



Reactive PIN FR for rigid polyurethane foam

The mineral – phosphorus PIN flame retardant, aluminium hypophosphite (AHP) was surface-reacted with melamine to generate a reactive PIN flame retardant (MCAHP) for application in polyurethane. Analysis (FTIR, SEM) showed that the AHP was effectively coated with a melamine derivative, with external active NH₂ groups. The MCAHP showed good compatibility with polyurethane foam, with smooth foam cells. DSC characterisation showed that the active groups contributed to cross-linking during the polyurethane foaming reaction, and so an increased glass transition temperature of the polyurethane foam. A 16.5% MCAHP loading in polyurethane foam enabled to achieve UL94-V0. The flame retardancy effect is considered to be the result of a well-structured char formation, generated by phosphoric acid released from AHP, water release from AHP and sublimation of melamine at c. 320°C consuming heat energy and releasing non-flammable gases which dilute fire gases.

FTIR = Fourier transform infrared analysis. SEM = scanning electron microscopy. DSC = differential scanning calorimeter.

“Surface modification of aluminum hypophosphite and its application for polyurethane foam composites”, F. Luo et al., J. Therm Anal Calorim, 2016 <http://dx.doi.org/10.1007/s10973-016-5908-6> *Reducing fire risks from wood in buildings and furniture*

Guide to PIN FR polymers for electrical and electronics

DuPont Performance Materials has published a 16 page [guide](#) to non-halogenated flame retardant (NHFR) polymers for electrical and electronics (E&E) applications. The stated objective is to help the E&E conform to demanding health, safety and environmental requirements. The [guide](#) addresses legislation requiring plastics and

elastomers to be halogen-free and flame-retardant, produce low smoke emissions, be recyclable, and comply with the WEEE and RoHS Directives and REACH. It also outlines key standards and tests for E&E industry compliance, including IEC 60335 and UL 94 for the safety of electrical appliances, EN 45545 for railways and UL 746 for polymers used in electrical equipment.

“DuPont announces new guide to non-halogenated flame retardant polymers for the electrical and electronics industry”, 22nd November 2016
<http://www.dupont.com/industries/plastics/press-releases/nhfr-polymers-for-electrical-and-electronics-industry.html>



Jakarta high-rise cladding fire

A fire in the Neo Soho building West Jakarta, 9th November 2016, damaged apartments over more than six floors as well as the attached shopping mall. The fire is [reported](#) to have spread rapidly through flammable external building cladding materials. This fire follows other incidents in high-rise building cladding in and will add to international concern that in many countries fire safety regulations or their enforcement for foam building cladding materials are not appropriate (see US NFPA position in [pinfa Newsletter n°72](#) and Dubai skyscraper cladding fire in [pinfa Newsletter n°69](#)).

Jakarta Post 9/11/2016 <http://www.thejakartapost.com/news/2016/11/09/neo-soho-in-west-jakarta-on-fire.html> *APF Magazine* <http://apfmag.mdmpublishing.com/jakarta-high-rise-fire-adds-to-the-current-flammable-cladding-debate/>



Dubai high-rise cladding fire

Yet another skyscraper has suffered a major fire in Dubai, United Arab Emirates. The luxury Adriatic building in the Oceana complex, Palm Jumeirah, 12th December, is reported to have started with an electrical fault in a coffee machine, before spreading through flammable exterior cladding panels. The UEA is currently preparing an update of its building fire safety code. Exterior claddings installed in buildings before 2012 did not have to be fire safety treated and a number of major fires have occurred, see Sulafa Tower fire ([pinfa Newsletter n°69](#)) and Address hotel fire ([pinfa Newsletter n°62](#)).

“Coffee machine clue to Dubai fire which burned through building ‘like it was made of paper’”
<http://www.thenational.ae/uae/environment/coffee-machine-clue-to-dubai-fire-which-burned-through-building-like-it-was-made-of-paper>

PIN FR foam roof structure and insulation

A US patent describes a roof system comprising a structural deck and polyisocyanurate insulation using a PIN flame retardant to achieve ASTM E-84 fire safety performance as well as roof waterproofing. The foam insulation uses a non-halogenated, phosphorus-based, reactive FR (DEHMP diethyl hydroxymethyl phosphonate at 2-5% loading) to achieve ASTM E-84 (flame spread and smoke density, Steiner Tunnel) and E1354-11b equivalent or better than with the halogenated FR TCPP. Other possible P-FRs cited are organo-phosphates, organo-phosphites, organo-phosphonates, such as dialkyl hydroxyalkanephosphonate or



diaryl hydroxyalkanephosphonate. The fire performance of the polyisocyanurate foam is indicated as resulting from the polyisocyanurate chemical functionalities, small foam cell size, despite use of flammable foam blowing agents.

“Roofing systems and roofing boards with non halogenated fire retardant”, US Patent n° 20150354220 of 27 December 2016, M. Nandi, L. Wang, J. Asrar, Johns Manville
<http://patents.justia.com/patent/9528269>



PIN FR sandwich panel achieves rail safety standards

Sicomín and 3A Composite Core Materials have [achieved](#) the European railway fire safety, smoke toxicity and smoke density standards EN 45545-2 with their PIN flame retardant sandwich panel. The panel combines Sicomin's infusion epoxy resin SR1125 with glass fibre, Sicomin's gel-coat system SGI128 and 3A's AIREX® T90 structural PET foam (polyethylene terephthalate), in GFRP (glass fibre reinforced polymer) skinned sandwich panel. The panels achieved overall fire hazard level HL2 for Category R1 in rail interior applications (such as ceilings, walls) and Category R7 for external uses (body shell, under-frames) with. They offer lightweight and high performance structural properties, sound and temperature insulation and external surface aesthetic quality and paintability.

“Sicomín epoxy infusion system and AIREX® T90 PET foam received EN45545-2 fire classification”, 22nd November 2016 www.sicomín.com

UK fire brigades taking longer to reach fires

A survey by the BBC (5live) suggests that UK fire brigade average response times to fires have continued to deteriorate in 2016, reaching for example 13 minutes in Suffolk and 8 minutes in Essex. This comes on top of government figures showing a worsening average response time from 2009/2010 to 2015/2016 for 80% of fire brigades (the government has not updated figures since then). Average England response time to dwelling fires in 2014/2015 was nearly 8 minutes, increased from less than 6 minutes in 1994/1995 (part of the increase may be due to data system changes). The head of the UK Fire Brigades Union (FBU) blames cuts in fire services budgets (17% reduction since 2010).

“Cuts undermining fire services, says Fire Brigades Union” 11/12/2016
<http://www.bbc.com/news/uk-38278596> and *“Fire Incidents Response Times: April 2014 to March 2015, England”, Fire & Rescue Statistical Release 19 November 2015*
<https://www.gov.uk/government/collections/fire-statistics>

LSZH drilling cables for fire and data performance

RSCC has further extended its Exane® range of LSZH (Low Smoke Zero Halogen) PIN flame retardant cables for highly demanding offshore and oil drilling applications. Exane ZH Cat 6 cables achieve IEEE 12020 Vertical Cable Tray Flame Test. The cables' stranded conductors offer high flexibility and signal transmission rate performance in drilling conditions. VITALink MC meets the ANSI/UL 2196-2012 Test for Fire Resistive Cables for 2 hours and NFPA 130 and NFPA 502 code requirements for mass transit and roadway tunnels applications, where fire resistance of cables is essential to maintain electrical and data transmission to

support safety installations and occupant escape. The cables use PIN flame retardants in RSCC's proprietary Exane® sheathing compound to achieve low smoke and low gas corrosivity emissions in case of fire.

RSSC Engineered Wire and Cable <http://www.r-scc.com/exane>

Tekra offers VTM-0 fire performance films

Tekra (a division of EIS Inc.) has achieved a new level of fire performance for polymer films, offering halogen-free VTM-0 fire performance with Tetoron® UF polyethylene terephthalate (PET) films and Teonex® QF polyethylene naphthalate (PEN) films. Both products are based on PIN flame retardants and combine chemical resistance, high tensile strength, dielectric properties and high quality white coloration (>90 diffuse reflectance across the visible light spectrum). Teonex® QF PEN can withstand processing temperatures up to 180°C. Both products available in thickness 25 to 250 microns and are adapted for applications including insulating materials and labels in electronics and batteries, flexible circuitry and lighting, offering more cost effective performance solutions than polyimide or polyester films currently on the market.

"Tekra Adds New Flame Retardant Polyester Films" <http://www.tekra.com/resources/press-releases/press-release-tekra-adds-new-flame-retardant-polyester-films>

See also Teijin in pinfa Newsletters n°s [47](#) and [50](#)

Tolsa clays: reducing smoke generation

Tolsa has extended its range of specialist minerals, based on naturally-sourced silicate clays, used as synergists to improve functionality and performance of PIN FR and polymer systems, whilst also reducing cost and improving processability. New ADINS® grades reduce smoke emission in e.g. rubber and PVC, in particular to ensure passenger safety in transport applications including seating, flooring, cables and structural elements. The product also acts with other flame retardants to improve fire performance (reduced heat release) in applications such as electrical and electronics and construction. Specific modification of the sepiolite clay enables good dispersion and interaction with polymers. Other ADINS® grades improve flame retardant performance in polymers including PP, PE, PA, PS and EVA, in particular in synergy with PIN phosphorus flame retardants (see pinfa Newsletter [n° 65](#)).

"Tolsa Group at K 2016: To Launch a New Range of FR to Reduce Smoke Emission", [22/7/2016](#)



US sprinkler requirements could better protect property

The US National Fire Protection Association (NFPA) journal assesses the effectiveness of current US sprinkler standard NFPA 13R (sprinklers in low-rise residential occupancies) suggesting that although effective in saving lives, changes are needed to better protect properties. Recent fires, in particular the luxury Avalon Hudson apartment complex, Edgewater, New Jersey, [January 2015](#) (\$ 80 million damage), show that considerable damage can result from fires starting and spreading in non-sprinklered areas, such as balconies or attics. NFPA states that

“fire can travel rapidly through these open areas if they are not protected with fire-resistant materials”.

“Is this a sprinkler success? Does success for an NFPA 13R sprinkler system mostly mean controlling a fire in a multifamily environment long enough to prevent deaths and injuries? Should success also include preventing significant property damage? Where’s the sweet spot, and how do we get there? A panel of stakeholders weighs in”, NFPA Journal Nov-Dec 2016 <http://www.nfpa.org/news-and-research/publications/nfpa-journal/2016/november-december-2016/features/sprinkler-systems> Photo <http://www.nbcnewyork.com>

Climate change increases wildfire risk in Western USA

The US National Fire Protection Association (NFPA) [considers](#) that it is “well understood that extended droughts and increasing temperatures over the past several decades have increased the ‘fuel aridity’ of the landscape”, so making wildfires worse in the West of the USA. A new [study](#) suggests that human contribution to this climate change has contributed to over 10 million acres of additional forest fire from 1984 to 2015, nearly doubling wildfire risk. The US spent over \$1.7 billion on suppressing wildfires in 2015. The problem and its costs have also been exacerbated by increased human settlement and suppression of landscape management activities.

“Dry & drier. A new study quantifies the impact of human-generated climate change on the threat of wildfire in the western U.S.”, NFPA Journal Nov-Dec 2016 <http://www.nfpa.org/news-and-research/publications/nfpa-journal/2016/november-december-2016/news-and-analysis/dispatches/dry-and-drier>

“Impact of anthropogenic climate change on wildfire across western US forests”, J. Abatzoglou et al., PNAS October 2016, vol. 113, n°42, 11770–11775 <http://dx.doi.org/10.1073/pnas.1607171113>

PIN flame retardant from aluminium dross waste

A US patent published 3-11-2016 presents production of a PIN flame retardant and surface protection product from aluminium dross, a waste substance generated during aluminium metal smelting and re-melting, using the low aluminium content dross which cannot be recycled in the aluminium process. Dross particles, generally 2mm or smaller, are reacted with an acid such as phosphoric acid. The resulting self-priming mixture is then applied to articles before drying for 12-24 hours, resulting in a fire safety treatment. The product can be used on materials such as wood fibre board, polyester ceiling batt, polystyrene, and can also provide rust protection for steel.

“Fire retardant, insulation material and surface protectant”, US patent 3-11-2016 n° 20160319134 <http://patents.justia.com/patent/20160319134>

Other News

Phenyl P-FRs in vitro tested for endocrine disruption. Seven phenyl phosphate PIN FRs * were tested in vitro on cultured mouse MA-10 Leydig tumour cells for effects on cellular activity, cytotoxicity and different steroid hormone productions. All 7 phenyl phosphates, and also the brominated FR (tetra-BDE = BDE-47) reduced

cell mitochondrial activity and cell number (cytotoxicity). All the phenyl phosphates but not BDE-47 increased superoxide production (oxidative cell stress). Different phenyl phosphates but not BDE-47 impacted different steroid production routes and/or progesterone biosynthesis gene expression. The authors conclude that these phenyl phosphate FRs have greater endocrine disrupter effects in this in vitro test than BDE-47.

** The phenyl phosphate FRs tested were: 2-ethylhexyl diphenyl phosphate (EDHP), isodecyl diphenyl phosphate (IDDP), triphenyl phosphate (TPHP), t-butylphenyl diphenyl phosphate (BPDP), isopropylated triphenyl phosphate (IPPP), tricresyl phosphate (TMPP) and tri-o-cresyl phosphate (TOCP).*

*“Organophosphate Flame Retardants Act as Endocrine-Disrupting Chemicals in MA-10 Mouse Tumor Leydig Cells”, G. Schang et al., Toxicological Sciences, 2016, Apr;150(2):499-509
<http://dx.doi.org/10.1093/toxsci/kfw012>*

American Chemical Council (ACC) calls to ratify Stockholm Convention. The US chemistry industry federation, ACC, has called on the Senate to ratify the Stockholm Convention on Persistent Organic Pollutants (POPs) in order to be able to participate in discussions on future Convention decisions, such as adding new chemicals to the POPs list. The Convention is already ratified by some 180 countries. Chemicals currently proposed for addition to the POPs list include the halogenated FRs Deca-BDE and short chain chlorinated paraffins (SCCPs) and PFOA (pentadecafluorooctanoic acid) used in fire fighting foams.

“Restricting POPs: Why the Stockholm Convention matters”, American Chemistry Council 13/10/2016 <https://blog.americanchemistry.com/2016/10/restricting-pops-why-the-stockholm-convention-matters/>

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For abbreviations see: www.pinfa.org