pinfa
Phosphorus, Inorganic & Nitrogen Flame Retardants Association

Your newsletter for non-halogen fire safety solutions n° 166 January 2025

ECHA Flame Retardants Report

ECHA report on Aromatic Brominated Flame Retardants (ABFRs)


ECHA
EUROPEAN CHEMICALS AGENCY

ECHA raises environmental concerns over certain aromatic brominated flame retardants

ECHA/NR/24/40

The European Chemicals Agency's (ECHA) investigation found that u retardant additives pollutes the environment due to their persistenc are released to the environment throughout the product lifecycle, wi

Helsinki, 18 December 2024 – ECHA has investigated, as requested by th aromatic brominated flame retardants (ABFRs), and their (potential) hazard alternatives and aspects related to recycling and waste management.

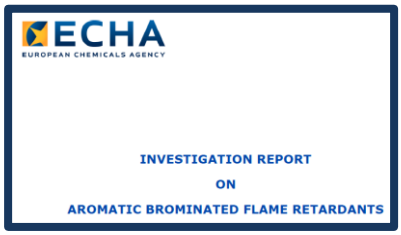
The investigation focused on 60 ABFRs that are potentially on the EU marke

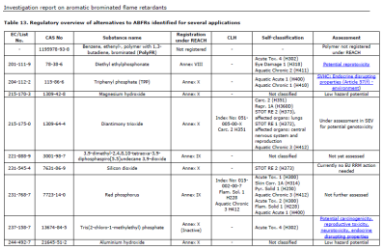
- **Environmental impact**
  Of all ABFRs, non-polymeric additives pose the highest environmental ri ECHA identified five substances with particular concern, confirmed to be very persistent and very bioaccumulative (vPvB). In addition, 37 ABFRs additives;
- **Uses and releases**
  ABFRs are used in many applications. The sectors contributing the most

Several ABFRs are concluded to be problematic (PBT) and ECHA recommends "group approach" regulatory action. ECHA considers that alternative FRs are available to replace ABFRs in many applications, but that some of these alternatives also pose questions.

ABFRs are chemicals in which one or more bromine atoms are covalently bound to an aromatic carbon ring. They can be additive, reactive or polymeric. 60 ABFRs were identified by ECHA (European Chemical Agency) as being potentially placed on the market in the EU (as chemicals or in articles), of which only 25 are REACH registered. ECHA concludes that although only 5 ABFRs are today formally identified as SVHC (Substance of Very High Concern) or PBT (persistent, bioaccumulating, toxic) or vPvB (very Persistent, very bioaccumulating), more than 40 of the 60 ABFRs are already identified as PBT/vPvB or "are likely to be PBT" (5+17 non-polymeric additive, 16 non-polymeric reactive, 5 precursors/monomers). ECHA also notes that chemical modelling (QSAR) suggests that other ABFRs (including polymeric) could decompose to potentially PBT chemicals. ECHA recommends a "group approach" for regulatory action on non-polymeric additive ABFRs.

The report notes that ABFRs are today widely used to contribute to fire safety in more than 40 different polymers (in particular epoxies, polyethylene, thermoplastic elastomers …), in many applications, in particular electronics, wires and cables, construction materials and textiles. Nearly all ABFRs used in Europe are imported. For most applications, in particular electronics (connectors, enclosures, printed circuit boards), many viable alternatives to ABFRs are





available, including non-combustible materials and organophosphorus FRs. ECHA did not find viable alternatives to ABFRs in some applications: in particular aerospace/defence, some sealants and adhesives, transparent polycarbonates, certain technical textiles. Polymeric ABFRs are identified as a viable alternative to non-polymeric ABFRs.

Wastes containing ABFRs are generally not recycled. Releases of non-polymeric ABFRs during waste management are particularly important (shredding, landfill …). ECHA notes concerns about release of ABFRs (in particular non-polymeric additive ABFRs) and degradation in the environment, with a particular need for more information on losses from microplastics.

ECHA identified a number of phosphorus-based FR alternatives with no regulatory or hazard issues. However, they also note that some organophosphorus FRs may have hazardous chemical properties, leach out of products into the environment, be found in the environment at higher concentrations than ABFRs****, and may require different technologies to identify and separate in waste treatment. Further investigation into organophosphorus FRs is thus needed to ensure that there is not regrettable substitution.

A concern identified is that non-polymeric ABFRs which have not been REACH registered "have been detected in the environment at high concentrations", leading ECHA to point to issues with compliance and with chemicals in articles imported into the EU*.

This ECHA report results from a request from the European Commission (22 December 2023 **) and two public calls for evidence (April 2024, June 2024 ***). This report is now transmitted to the European Commission who will now decide whether to request ECHA to prepare a regulatory restriction proposal for ABFRs and if so what its scope should be.

** pinfa note: A significant issue with REACH is that only specific chemicals present in imported 'articles' (such as finished products like telephones or components like printed circuit boards) are subject to REACH regulations. While REACH restriction targeting chemicals in articles can also target import in its scope, weak enforcement still allows restricted substances to enter the EU. Additionally, the authorisation process does not cover imported articles, meaning substances banned in the EU can still be imported within articles. Hence, based on deeper assessment on the impact on EU market, authorities can submit a restriction to address it.*

*** pinfa Newsletter n°159*

**** pinfa Newsletter n°161*

***** high environmental concentrations attributed to organophosphorus FRs are in some cases due to use of the same chemical for other purposes, e.g. in polishes, nail varnishes, as plasticisers.*

"ECHA raises environmental concerns over certain aromatic brominated flame retardants", ECHA/NR/24/40, European chemicals Agency (ECHA), 18 December 2025 https://echa.europa.eu/-/echa-raises-environmental-concerns-over-certain-aromatic-brominated-flame-retardants

"Investigation report on Aromatic Brominated Flame Retardants", 18 December 2024, 117 pages plus appendices https://echa.europa.eu/completed-activities-on-restriction

PINFA IN ACTION

pinfa-NA explainer video n°8: smoke toxicity

Short educational video (4 minutes) explains why all fire smoke is toxic and how flame retardants can reduce the risks. This is the 8th video in the pinfa-NA "Explainer" series explaining fire safety, fire regulations and flame retardants. This video explains that smoke is the main killer in fires, containing toxic gases and soot particles generated by the many different materials in our homes. Smoke poses particular risks for firefighters because of repeated exposure and possible accumulation of soot particles on protective clothing and equipment. Flame retardants reduce smoke by preventing fires or reducing their spread. If a fire does develop, different flame retardants can have different effects on smoke in different materials, but studies have shown that in many materials they do not increase smoke toxicity (see CREPIM study in pinfa Newsletter n°149). Also, FRs are only used in specific applications where fire protection is required (e.g. electronics) so are present in only a small percentage of materials in our homes, so have only a marginal impact on smoke if the fire does develop. "To sum it up, in a real world fire there is no such thing as safe smoke, and toxic smoke will be formed with or without the presence of flame retardants".

pinfa-NA VOFR-CM (Value of Flame Retardant-Containing Materials) Explainer Video Series https://www.pinfa-na.org/learnfrmaterials

China Ancient Building Fire Safety Forum

Summary of pinfa China workshop, 28th November 2024, Hangzhou: flame retardants to protect historical treasures. Leaders in ancient building preservation met experts from the flame retardant industry to explore how flame retardant technologies can contribute to protecting China's ancient architectural heritage, addressing in particular flame retardants for wood and for timber structures, fire safety requirements and standards for ancient buildings, transparent flame retardant coatings, fire safety design for ancient buildings, high-performance fire safety materials and emerging fire protection challenges.

Speakers included: Zhou Kan, Polyrocks; Xiao Zenan, Fire Protection of Cultural Heritage Buildings at the China Academy of Building Research; Sebastian Moschel, Clariant; Che Tong, Architectural Design and Research Institute XUAT; Zhou Weijie, pinfa China; Xu Xiaonan, fire safety expert; Liu Xueyun, pinfa China; Cao Kun, Zhejiang University; Hu Tao, Helwe; Noelia Mansilla, and Cao Xin, Budenheim;

Through joint efforts of all parties, pinfa China looks forward to building a solid firewall for the protection and preservation of ancient buildings by innovation in non-halogenated flame retardant technology, material development, and refinement of design standards. May the treasures of history continue to shine through the ages, preserving the legacy of culture for generations to come.

Original article by pinfa China Halogen-Free Flame Retardants 2 December 2024 http://www.pinfachina.net/

FIRE SAFETY AND MEDIA

IFSJ fire safety 'Influencers' perspectives

30 experts point to new fire risks from batteries, renewable energies, green buildings and ubiquitous electronics (internet of things), accentuated by urban density and wildfire risks. Several interviews deplore the tendency over recent decades to put cost and speed before fire safety. This International Fire Safety Journal special edition presents 30 one-page perspective interviews on the future of fire safety and firefighting from leading firefighters, experts, researchers and industry. Smart technologies are considered to offer important opportunities for fire detection/prevention, firefighting and firefighter training. Strong concerns are expressed by many of the influencers about cancer risks for firefighters, linked to smoke and contaminant exposure, is a strongly voiced concern, citing frequent exposure to smoke during training exercises. The need for better firefighter training concerning smoke health risks, prevention (e.g. cleaning of equipment) and health monitoring. Virtual reality, artificial intelligence and technologies such as drones offer major opportunities for firefighter training and for in-fire interventions.

"Special Influencers Edition", International Fire Safety Journal (IFJS), issue 42, December 2024 https://internationalfireandsafetyjournal.com/ *and* [direct link to pdf magazine](#).

Flammable mattress blamed for hotel fire

An air conditioner fault igniting a mattress caused a fire which killed 7 and injured 12 in hotel in Bucheon, South Korea, according to authorities based on CCTV footage. Guests entering a hotel room heard a noise from the air conditioner and smelled smoke, asked for and moved to another room. The first room door was left open and smoke spread rapidly to the whole floor. Authorities indicate that the fire was caused by sparks from a short-circuit or other electrical fault in the air conditioner igniting a flammable mattress and sofa nearby. The fire deaths were blamed on rapid spread of toxic smoke. The hotel was not equipped with sprinklers, and was not legally required to have these.

"Flammable mattresses blamed for hotel fire in Gyeonggi that killed seven" https://koreajoongangdaily.joins.com/news/2024-08-25/national/socialAffairs/Flammable-mattresses-blamed-for-hotel-fire-in-Gyeonggi-that-killed-seven/2120019 *and "Why did the Bucheon hotel fire claim so many lives?"* https://www.koreatimes.co.kr/www/nation/2024/12/113_381102.html *- date of fire: 22nd August 2024*

Photo - FIRSTPOSTIN: https://www.facebook.com/firstpostin/videos/fire-breaks-out-at-a-hotel-in-south-korea-at-least-7-dead-subscribe-to-firstpost/1139984923730865/

E-bike fire risks in schools

Netherlands schools are banning e-bike batteries, installing fire resistant cabinets or establishing charging stations. The Netherlands fire services indicate that they are making efforts to inform schools of the fire risks of e-bike batteries, which can fill a room with highly toxic smoke in a few seconds in case of misfunction. The fire services indicate that although mobile phone or laptop batteries can also explode, an e-bike battery fire is much more dangerous, requiring to urgently move away from it.

"Brandende fietsaccu's in de klas? Scholen nemen voorzorgsmaatregelen" (Burning bicycle batteries in the classroom? Schools take precautions), NOS News, The Netherlands, 29th November 2024
https://nos.nl/l/2546314

FRs: the show goes on

Theatregoers in the UK expect to see the fire safety curtain go down and up before the show. It is there to stop a fire on stage putting the public at risk. And as parents at Christmas pantomimes answer their children's question "what is that for?", it incidentally plays an important role in fire safety education. A blog by Theatrecomplianceau explains to entertainment professionals why flame retardants also are important in keeping the stage set safe. It explains different types of flame retardant, how they work, and different onstage applications.

"How do Fire Retardants reduce Flammability and Delay spread?", Theatrecomplianceau, 20th August 2024
https://medium.com/@theatrecomplianceau/how-do-fire-retardants-reduce-flammability-and-delay-spread-da93c18cf4b6

Photo: Ji-Elle (Wikipedia)
https://en.wikipedia.org/wiki/Safety_curtain#/media/File:London-St_Martin's_Theatre-Safety_curtain.jpg

POLICY AND REGULATION

EU Council confirms Chemicals Strategy

Member States discussed implementation by the European Commission of the Chemicals Strategy for Sustainability (CSS). At the Council meeting of 14th October 2024, national Environment Ministers discussed the CSS, as a key part of the EU Green Deal, in particular the revision of REACH (the EU Chemicals Regulation), the restriction of PFAS, banning export of chemicals which are banned in Europe and strengthening the European Chemicals Agency (ECHA). The Hungary Presidency's preparatory note to the meeting states: "It should remain a priority for the EU and its Member States to reach the objectives of the Strategy [CSS] while also considering the new challenges". The President of the European

Commission, Ursula von der Leyen has written that the EU must "stay the course on the goals set out in the European Green Deal". and that a "new chemicals industry package, aiming at sustainable competitiveness of this enabling industry … will simplify REACH and provide clarity on PFAS ... with sustainability, competitiveness, security and safety considerations in mind".

Ursula von der Leyen's "mission letter" for the new Commissioner for Environment, Water Resilience and a Competitive Circular Economy, 17th September 2024 https://commission.europa.eu/about/commission-2024-2029/commissioners-designate-2024-2029_en

"Council urges Commission to take effective measures for Chemicals Strategy implementation", European Environmental Bureau, 14th October 2024 https://eeb.org/council-urges-commission-to-take-effective-measures-for-chemicals-strategy-implementation/

"Environment Council, 14 October 2024, Main results" https://www.consilium.europa.eu/en/meetings/env/2024/10/14/

"Chemicals Strategy for Sustainability – State of play and way forward - Exchange of views", Hungary Presidency preparatory note for Council, 4th October 2024 https://data.consilium.europa.eu/doc/document/ST-13949-2024-INIT/en/pdf

ECHA update on PFAS restriction process

Further assessment is underway into uses, restriction options other than a ban, with further consultation planned for 2025. The European Chemicals Agency (ECHA) indicates that this is because of the complexity of the dossier (> 10 000 substances used in more than ten different sectors) and follows wide input to the public consultation on a draft restriction proposal (Feb. 2023), with 5 600 comments, leading to identification of further uses, specific questions on fluoropolymers, and considerable information on hazards and risks, on economic impacts of possible restrictions and on alternatives. Restriction options other than a ban or time-limited restrictions are therefore being considered (that is, possibly no horizon date for some uses where impacts of a ban would be disproportionate). This particularly targets sustainable energy technologies (batteries, fuel cells, electrolysers), semiconductors and medical devices. Further public consultation will be organised in 2025 on a draft ECHA Opinion after consultation of ECHA's RAC (Risk Assessment) and SEAC (Socio-Economic Analysis) Committees. Fire safety is concerned as PTFE (a PFAS polymer) is widely used as a robust and versatile processing agent for polymer compounds and, alongside flame retardants, is very effective to prevent flaming dripping and reduce smoke in fire.

"Progress update on the per- and polyfluoroalkyl substances (PFAS) restriction process", European Chemicals Agency (ECHA), 20th November 2024 https://echa.europa.eu/-/echa-and-five-european-countries-issue-progress-update-on-pfas-restriction

New York non-mineral FR ban in force

State bans many FRs from furniture and halogenated FRs from TVs/screen enclosures and stands. The bans were signed into law in January 2022 (see pinfa Newsletter n°135) and entered into force on 1st December 2024. The mattress and upholstered furniture FR ban concerns any "halogenated, organophosphorus, organonitrogen or nanoscale chemical" with a functional use to resist or inhibit fire, including synergists, thus banning all FRs except (non-nano) inorganic PIN FRs. New or reupholstered furniture may not contain any such intentionally added FR (with exemptions for furniture electronics, stitching thread, natural fibres and modacrylic barriers not containing antimony). For TVs and electronic displays, halogenated FRs (only) are banned in stands and enclosures.

New York Consolidated Laws, ch. 43-B Environmental Conservation, art. 37 "Substances Hazardous or Acutely Hazardous to Public Health, Safety or the Environment", Title 10 "Regulation on Chemicals in Upholstered Furniture, Mattresses and Electronic Enclosures"
https://www.nysenate.gov/legislation/laws/ENV/A37T10

European façade test method validated

The European Commission has approved the final report on a harmonised façade fire safety testing methodology. The decision is an important step towards standardising across Europe the fire testing and fire classification of façade systems, addressing current variations between Member States and including detailed technical guidance to ensure comprehensive fire safety assessment of façade elements. The test method covers fire spread and falling parts under different fire conditions (e.g. wind, façade openings), using standardised combustion chamber design, heat source and specimen set-up, with the aim of reflecting real-life fire conditions. The methodology has been validated by round-robin testing, with input from 29 fire test laboratories across Europe. The 250 page final report includes a literature survey, detailed description of the proposed testing methods, results from tests and proposed fire performance classifications.

"Finalisation of the European approach to assess the fire performance of façades" SI2.825082, J. Anderson et al. RiSE, BAM, Efectis for the European Commission, 2024 https://97f03b11-97a0-4bad-90d7-9dba8685c07a.usrfiles.com/ugd/9074c2_813067fed547436480cb65b2a27b8630.pdf

Photo: Video captures of large-scale test at ÉMI Hungary on EU Aluminium façade at 21 ½ minutes after ignition. Figure 5.14 from the European Commission report.

United Nations

No agreement reached on UN plastics treaty

The 5th UN 'Global Plastics Treaty' session failed to reach agreement and closed on 1st December with no treaty, after two years of negotiation. The 5th session was a week of discussions with over 3 300 participants from over 170 countries. There were disagreements on the reduction of overall plastic production, banning of certain plastic products, chemicals of concern in products, design of plastics, extended producer responsibility and waste management. Agreement was reached on a 22-page "Chair's Text" which will be the basis for future negotiations. This contains different options of the various articles of a possible future treaty text. This text includes for example the proposal (art. 3) to prohibit / reduce / manage … the manufacture of articles … containing chemicals which are hazardous / identified in the treaty as posing a risk in the relevant article / toxic to health or the environment … and a proposal on requiring information on certain chemicals in plastic products and traceability.

"EU regrets inconclusive global plastics treaty", European Commission (DG ENVI), 2nd December 2024
https://environment.ec.europa.eu/news/eu-regrets-inconclusive-global-plastics-treaty-2024-12-02_en

"Plastic pollution treaty negotiations adjourn in Busan, to resume next year", United Nations, 1st December 2024
https://news.un.org/en/story/2024/12/1157646

Agreed "Chair's Text", United Nations, 1st December 2024
https://wedocs.unep.org/bitstream/handle/20.500.11822/46710/Chairs_Text.pdf

RECYCLING

PIN FR for PET plastic recycling

Mineral PIN flame retardants zinc oxide and ATH demonstrated in solvent PET recycling to PIN FR polyurethane foam. Post consumer PET flakes [poly(ethylene terephthalate] were dissolved by microwave heating in diethylene glycol (DEG) solvent with a zinc sulphate catalyst for 1 hour 20 mins, generating an oligodiol. Nano zinc oxide was synthetised by reacting zinc nitrate with potassium hydroxide, precipitating then grinding. A polyurethane foam was produced by reacting the oligodiol with methylene diphenyl diisocyanate, with DBDL catalyst (dibutyltin dilaurate), a surfactant and water as blowing agent. The zinc oxide and commercial ATH (aluminium hydroxide) were included into the foaming process at 1 – 7% and 50 – 60% loading respectively. The zinc oxide led to a lower density foam, compensating the tendency of ATH to increase foam density. The ATH increased foam cell uniformity and mechanical properties. At 60% ATH, UL 95 (VB) rating of V-0 was achieved (self-extinguishing).

"Sustainable polyurethane nanocomposite foam from waste poly(ethylene terephthalate): preparation, thermal stability, and flame retardancy", H. Vothi et al., Macromolecular Research (2024) 32:1227–1235, https://doi.org/10.1007/s13233-024-00304-3

Non-Classified PIN FR for intumescents

Clariant (pinfa member) low-solubility nitrogen phosphorus non-halogenated FR for environment and fire safety. The ammonium polyphosphate based compound is non-Classified (for health and environment as used), does not use melamine or other classified precursors so is SVHC-free and is (bio)degradable to natural phosphate and ammonium moieties. The PIN FR is supplied in aqueous suspension and is non-hygroscopic. It can be used in cellulose materials (wood, paper), composites and polymers, including in polyurethane foams, in epoxies and in thermosets. It is also highly effective in firestops, sealings and intumescent coatings to protect materials from burning and from heat in case of fire.

"A new, safer solution with exceptional fire performance: Clariant's Exolit™ AP 422 A", 6th November 2024
https://www.clariant.com/en/Corporate/News/2024/11/A-new-safer-solution-with-exceptional-fire-performance-Clariants-Exolittrade-AP-422-A

***** *SVHC = substance of very high concern, as defined under EU chemicals regulation REACH.*

Phosphorus PIN FR for PBT recycling

A phosphorus PIN flame retardant copolymer achieved UL 94 V-0 in waste PBT chemically recycled to PBAT. Waste PBT (polybutylene terephthalate) was chemically depolymerised to BHBT (butylene terephthalate) at 225°C – 2 hours with a zinc argon catalyst. The PIN FR copolymer, 2-carboxyethyl (phenyl) diphosphinic acid dihydroxybutyl ester (BHBcept), was produced by reacting 3-hydroxyphenylphosphinyl-propanoic acid (CEPPA) with BHAT (butylene glycol adipate). The biodegradable polymer PBAT (Polybutylene terephthalate/butylene terephthalate) was then copolymerised with this PIN FR copolymer. The inclusion of 5%-mol CEPPA (c. 0.7% P content) increased LOI of the PBAT by around 50%, reduced peak heat release rate by 20% and achieved UL 94 V-0 (3 mm), but increases smoke release by +17% and deteriorates mechanical properties significantly compared to neat PBAT.

"Preparation of PBAT Copolyesters with Flame Retardant and Degradable Functions through PBT Chemical Alcoholysis and Closed-Loop Recycling", J. Liu et al., ACS Sustainable Chem. Eng. 2024, 12, 17301−17318, https://doi.org/10.1021/acssuschemeng.4c07032

PIN FR eco-benign wildfire stop spray coat

Ammonium polyphosphate – triazin spray can provide eco-friendly fire block protection of vegetation. Wildfire frequency is increasing globally with climate change. The difficulty of extinguishing wildfires means that establishing effective firebreaks is essential to protect lives and property. In this lab test, a 40% solution of commercial PIN FR ammonium polyphosphate (APP) with a lab-synthesised triazine was tested as a spray-on firestop on dry pine needles with a horizontal flame and various wind speeds, at approx. 1 m^2 scale. The PIN FR solution reduced total heat release by -30% and smoke production by nearly -20%. The phosphorus content of the APP was considered to catalyse release of polyhydroxyl compounds from the vegetation material, so

resulting in fire-protective charring. The authors conclude that this PIN FR solution could be an effective fire break, with spray application onto vegetation by drones.

"Development of eco-benign firebreaks based on flame-retardant ammonium polyphosphate hybrid system", W. Ye et al., Sustainable Materials and Technologies 43 (2025) e01208, https://doi.org/10.1016/j.susmat.2024.e01208

RESEARCH AND INNOVATION

PIN FR for UL 94 V-0 recycled polypropylene

Nitrogen – phosphorus PIN FR from Budenheim (pinfa member) ensures fire safety and performance of recycled polymer, enabling replacement of primary polyamide in electrical and transport applications. The 100% PCR (post-consumer recycled) polypropylene (PP) from Ecobat uses Budenheim's melamine phosphorus compound to achieve UL 94 V-0 (1.6 mm) fire performance and demanding technical requirements. It is the first PCR polypropylene to be V-0 certified. The PIN flame retardant acts by generating a foamed char layer on the polymer surface in case of fire, so preventing oxygen reaching the polymer and so preventing burning and reducing release of toxic gases. The material is already being used in e-bike batteries, in a honeycomb mesh in which the cells are installed. It has been nominated in the materials category for Kunstoff Magazin Product of the Year.

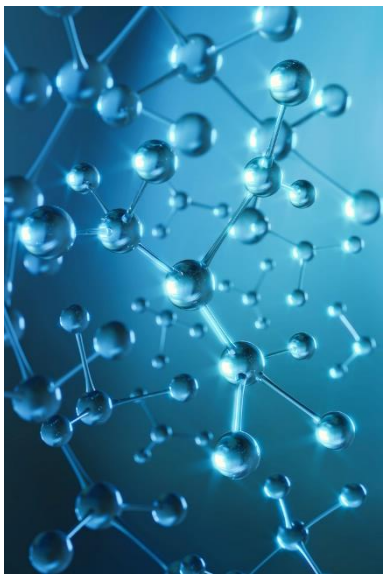
"Yellow Card Certificate for Polypropylene Compound from Ecobat", Budenheim press release 28th November 2024. Photo: Ecobat. https://www.budenheim.com/news/yellow-card-certificate-for-polypropylene-compound-from-ecobat-MCJQPKT6JU6ZFM7FX36D25FNZXLU

Reactive PIN FR for rigid polyurethanes

ICL (pinfa member) has launched an innovative phosphorus PIN FR which reacts into rigid PIR and PUR insulation foams. These are widely used for sheathings and for wall and roof insulation (more than 70% of commercial roofs). Because the new PIN FR reacts into the foam, it is stable and durable, without migration, so offering sustainability benefits. It is compatible with existing foam processes, chemically binding into the foam during production. It is a low-viscosity liquid, soluble in most organic solvents, with high polymer compatibility and benefits as a processing aid by reducing viscosity. It can be a "drop in" replacement for the chlorinated additive TCPP in rigid PIR and PUR foam products and closed-cell spray foams.

"ICL Unveils Breakthrough in Flame Retardant Technology", ICL, 13th December 2024 https://investors.icl-group.com/reports-news-and-events/press-releases/press-releases-details/2024/ICL-Unveils-Breakthrough-in-Flame-Retardant-Technology/default.aspx

"VeriQuel R100 Polyurethanes Reactive Flame Retardant" https://icl-industrialproducts.com/products/veriquel-r100-polyurethanes-reactive-fr/



PIN S – K - Si FR for polycarbonate

A combination of a sulphonate potassium salt and polysiloxanes achieved UL 94 V-0 (1.6 mm) in polycarbonate. 1,3-benzenedisulphonic acid potassium salt (KSP, containing sulphur and potassium) at 0.03% loading and three different polysiloxanes (organic silicon containing molecules) at 1 – 3%, plus PTFE (PFAS anti-drip agent) 0.3% and an antioxidant 0.6% were compounded into polycarbonate (screw extruder) then injection moulded @ 285°C. The addition of the PIN FRs caused only small reductions in polycarbonate transparency, tensile strength and elongation at break. Fire performance was improved with all three of the polysiloxanes and at only 1% loading all three achieved UL 94 V-0 (1.6 mm, vs. v-2 for neat polycarbonate). The samples with 3% loading of polysiloxane showed up to +40% LOI, -45% peak heat release and -40% total smoke. The most effective of the three polysiloxanes tested was octaphenylsilsesquioxane.

"Enhancing the flame retardancy of polycarbonate through the synergistic effect of 1,3-Benzenedisulfonate acid dipotassium salt and phenyl polysiloxanes", X. Zhang et al., J Appl Polym Sci. 2024; 141:e56071, https://doi.org/10.1002/app.56071

HEALTH AND ENVIRONMENT

Firefighter cancer risk

Firefighters have lower overall cancer risk than general population but higher risks for certain specific cancers. Meta-analysis of 38 quality-sorted published studies (1978 – 2022) generally confirms results of previous such analysis. Firefighters show higher risks of incidence and/or mortality for certain specific types of cancer, in particular skin cancers and prostate cancer, but lower overall cancer incidence and mortality than the general population. Cancer was recognised as a firefighter health risk by the WHO's IARC (International Agency for Research on Cancer) in 2022 (see pinfa Newsletter n°140). pinfa considers this a serious concern, noting that PIN flame retardants overall reduce firefighter exposure to smoke by preventing fires and reducing smoke emissions, and that it is also important to reduce firefighter exposure to smoke and soot which are always toxic.

"Cancer risk and mortality among firefighters: a meta-analytic review", D. Lee et al., Frontiers in Oncology 2023
https://doi.org/10.3389/fonc.2023.1130754

E-waste FRs below risk threshold

Dermal and inhalation exposure to flame retardants of electronics waste dismantling workers below risk levels. Two studies estimated dermal and inhalation exposure to different FRs of workers in a Catalunya e-waste facility (cathode ray tube dismantling, general e-waste grinding). Dermal exposure was assessed by looking at FR accumulation in cloth of T-shirts (particles) and using wristbands which capture volatile compounds. A second study assessed inhalation. Combining both exposures resulted in calculated cancer and other risks below thresholds. The use of PPE (personal protective equipment, e.g. face masks) and frequent washing of clothes are recommended to reduce exposure.

"Dermal exposure assessment of formal e-waste dismantlers to flame retardants and plasticizers using passive sampling methodologies", A. Balasch et al., Environment International 192 (2024) 109021, https://doi.org/10.1016/j.envint.2024.109021

"Exposure of e-waste dismantlers from a formal recycling facility in Spain to inhalable organophosphate and halogenated flame retardants", A. Balasch et al., Chemosphere 294, 2022 https://doi.org/10.1016/j.chemosphere.2022.133775

PUBLISHER INFORMATION

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