pinfa
Phosphorus, Inorganic & Nitrogen Flame Retardants Association

Your newsletter for non-halogen fire safety solutions n° 154 November 2023

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SAVE THE DATE

Free webinar on new drip suppressants

6th December 2023. Will address alternative anti-drip solutions to PTFE (a PFAS chemical) for fire performance. Roger Avakian, polymer formulation expert, will look at possible routes to avoid flaming melt-drip, necessary to ensure fire safety and achieve UL 94 V-0, in polymers such as polycarbonate, polyolefins. For formulators and compounders, material experts, stakeholders.

6th pinfa-NA Listen & Learn webinar, 6th December 2023, 11h30-12h30 ET (16h30-17h30 CET) https://www.pinfa-na.org/dripsupressants

PINFA QUESTIONS & ANSWERS

Chemicals Strategy for Sustainability (CSS)

pinfa's Q&A (8 pages) provides detailed information for users on regulatory impacts of the EU's CSS on PIN flame retardants, including REACH, CPL, Assessment of Regulatory Needs and the ECHA Flame Retardant Strategy, "Grouping" of FRs, Regrettable Substitution, Restriction, Essential Use concept. The aim is not to provide full information on chemical regulation but to explain which aspects of the Chemicals Strategy for Sustainability are relevant to and likely to impact PIN FRs. The Q&A provides links to relevant EU policy and regulatory documents, and to Cefic documents. For full regulatory information concerning specific PIN flame retardant products, users should contact their supplier.

"The Chemicals Strategy for Sustainability (CSS) and its impact for flame retardants (FR)", A pinfa Frequently Asked Questions (FAQ) document, 30th September 2023 and updated regularly https://www.pinfa.eu/wp-content/uploads/2022/05/pinfa_CSS_QA_final.pdf

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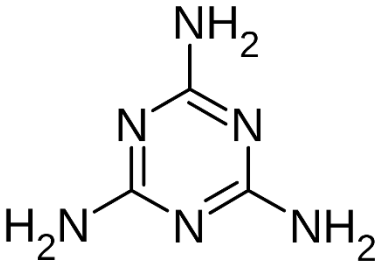


REACH and CLP Classification of melamine

pinfa's Q&A explains implications for melamine-based flame retardants and for use of melamine itself for fire safety. Melamine has been identified as SVHC under REACH and Carc. 2, H351 and STOT RE 2, H373 under CLP. In melamine-based FRs*, melamine is chemically reacted with another substance which leads to a new and different substance. Melamine-based FRs are not directly concerned by the classification of melamine (unless they contain > 0.1% of unreacted melamine). Several melamine-based FRs are validated in labels or certifications such as TCO or Ökotex. The Q&A explains possible implications for melamine-based FRs. Melamine is also used itself as a flame retardant or in intumescent coatings, in which case the REACH and CLP classifications are directly applicable. For full information, users should consult the SDS of their supplier.

** Widely used melamine-based FRs today include melamine phosphate, melamine cyanurate, melamine polyphosphate, melamine-poly(zinc phosphate), melamine pyrophosphate, melamine cyanurate.*

"pinfa frequently asked questions (FAQ) about melamine-based flame retardants and recent regulatory risk management measures on melamine. 21st August 2023 and updated regularly https://www.pinfa.eu/wp-content/uploads/2022/05/pinfa-Melamine-based-FRs_QA_final_20231006.pdf

For information concerning melamine itself, see EMPA (European Melamine Producers Association) regulatory page https://melamine.cefic.org/regulatory-status/

POLICY

Cefic industry manifesto for Europe

Cefic has released its manifesto 'Teaming up for a Climate-Neutral and Competitive Europe' outlining its key priorities for the new EU institutional cycle. The manifesto emphasises the industry's commitment to supporting the EU Green Deal and the importance of a legislative environment that facilitates the industry's transition to 2050. Over five priorities, the chemical industry urges the new European Commission term to address these challenges and create favourable conditions for private sector investments which support Europe's industrial transformation. The manifesto calls to:

- Prioritise abundant renewable energy and raw material self sufficiency
- Scale up renewable carbon and circular carbon feedstocks
- Make Europe attractive for industry investments
- Leverage the Single Market for the Transition
- Make the innovation framework smarter

See also Cefic position on the EU "Transition pathway for the chemical industry", January 2020, in pinfa Newsletter n°146

"Teaming up for a climate neutral and competitive Europe. Chemical industry's manifesto for the 2024-2029 legislative term", July 2023 https://cefic.org/media-corner/newsroom/cefic-publishes-manifesto-teaming-up-for-a-climate-neutral-and-competitive-europe/

pinfa input UK Furniture Fire Safety Regs

pinfa welcomes the UK's commitment to furniture fire safety, supports that FRs be only used where appropriate and underlines that recognised safe PIN FRs are available. The UK currently has the world's most demanding fire safety regulations for domestic furniture, requiring resistance of materials to both a small flame and a smouldering heat source (cigarette) as well as fire resistance of padding foams. Presenting the proposed regulation revision, the UK Government states that these regulations have reduced deaths by fire and are a recognised "gold standard" for fire safety. The proposed revision (see pinfa Newsletter n°152) will facilitate flexible design and testing, and also instigates a Flame Retardant Technology Hierarchy, requiring companies to demonstrate that other solutions for fire safety are not practical if flame retardants are used (design changes, inherently non-flammable materials). pinfa's input

- welcomes the continuing UK commitment to high fire safety requirements for domestic upholstered furniture,
- welcomes the principle of small flame + cigarette + foam fire resistance requirements maintained,
- questions the definitions of "flame retardants" and "inherently flame-retardant material" in the proposed Hierarchy: e.g. reactive or polymeric FRs, synergists, smoke suppressants,
- underlines the need to assess chemical risk (taking into account exposure), not only "hazard".

pinfa underlines that recognised safe PIN flame retardants are available for furniture fire safety, listing ten PIN FRs which have no environmental or health classification and which are TCO or Oekotex accepted:

- Bisphenol A diphosphate
- Tetrakis (2,6-dimethylphenyl)-m-phenylene biphosphate
- Siloxanes and silicones, di-Me, di-Ph, polymers with Ph silsesquioxanes
- Phenoxyphosphazene / hexaphenoxycyclotriphosphazene (HPCP)
- Polyphosphonates
- Phosphonic acid, (3([hydroxymethlyl]amino)-3-oxopropyl-dimethyl ester
- Reaction mass of 3-[(diphenoxyphosphoryl)oxy]phenyl triphenyl 1,3-phenylene bis(phosphate) and tetraphenyl 1,3-phenylene bis(phosphate)
- Proprietary organosphorus-based flame retardants
- Ammonium polyphosphate
- Melamine polyphosphate
- N-alkoxy hindered amine

UK Government public consultation "Smarter Regulation: Fire safety of domestic upholstered furniture", closed 24th October 2023
https://www.gov.uk/government/consultations/smarter-regulation-fire-safety-of-domestic-upholstered-furniture

pinfa input to the UK consultation: https://www.pinfa.eu/flame-retardants/position-papers/

Uncertain EU chemicals regulation revision

Will the European Commission engage the revision of REACH before end 2023 or whether it will be delayed? In answers to the European Parliament, Maroš Šefčovič, European Commissioner now responsible for the Green Deal, did not commit to table the REACH revision by end-2023 saying that "preparations will continue". If the draft legal text is not published by end 2023, then European Parliament will not start its first reading before European Elections next June, and then the proposal will have to be resubmitted (or not?) by the new European Commission after the elections. Mr. Šefčovič stated that work is underway to define revisions of REACH to "significantly reduce health hazards and environmental damage from chemical pollution and address the chemicals of very high concern, while ensuring the availability of chemicals that are essential for the key green transition technologies, guaranteeing the level playing field vis-à-vis our international competitors and avoiding too high an administrative burden on European businesses."

Maroš Šefčovič written answers to the European Parliament, 2nd October 2023 https://www.europarl.europa.eu/news/files/commissionners/maros-sefcovic/en-maros-sefcovic-written-questions-and-answers.pdf and 11th October 2023 https://www.europarl.europa.eu/news/files/commissionners/maros-sefcovic/en-maros-sefcovic-additional-questions-and-answers.pdf

CAR PARK FIRES

Luton airport car park destroyed by fire

A fire starting in a diesel-engine car closed Luton airport, UK, for over 12 hours, destroyed 1400 cars as well as the building. The fire in the Terminal 2 car park, 10th October, has been indicated by fire services to have started with a fault in a diesel-engine car, but rumours on social media state that it started in an electric car (e.g. here). Over 1 200 cars were damaged or destroyed and the car park building will have to be completely demolished.

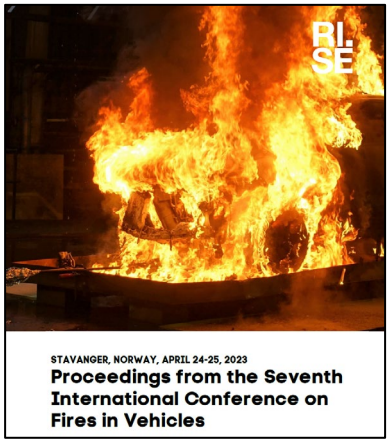
"Luton fire not caused by electric car, emergency services say" AFP Fact Check https://factcheck.afp.com/doc.afp.com.33XY4Z9

"Luton airport fire car park to be 'fully demolished' ", BBC News, 4th November 2023 https://www.bbc.com/news/uk-england-beds-bucks-herts-67313813

Netherlands: fire safety of EVs in garages

70-page review by Public Safety Institute NIPV on fire safety of car parks housing electric vehicles. Internal combustion engine vehicles in car parks pose specific fire safety issues, as shown by recent major car park fires (e.g. Paris, Liverpool, Stavanger, The Hague, Twente, see document p.11 and more recently Luton, see below). These risks are increased with electric vehicles which can contain more plastics and other flammable materials. Batteries in EVs bring specific new risks because the charged battery can contain twice as much potential energy as a full fuel tank, and because of electrical risks, specific toxic gas emissions and difficult to extinguish battery fires (tendency to reignite). The NIPV report discusses fire prevention and repression measures, car park design, fire fighting, as well as fire scenarios and data and research needs.

"Fire safety of indoor car parks accommodating electrically powered vehicles", NIPV (Netherlands Institute for Public Safety), September 2023 *https://nipv.nl/wp-content/uploads/2023/09/20210715-NIPV-Fire-safety-of-indoor-car-parks-accommodating-electrically-powered-vehicles.pdf*



Hazards of EVs in car parks and fire-fighting

EVs do not pose greater fire risks than internal combustion cars, but different risks and fire-fighting challenges. Victoria Hutchison, US Fire Protection Research Foundation (NFPA), at FiVE April 2023, summarised current understanding on vehicle fire risks in car parks and implications for fire fighting tactics. Modern vehicles, both EV and conventional internal combustion engine (ICE), contain more polymer and other flammable materials, in order to reduce weight and so improve fuel efficiency. The heat release rate of cars in fire is driven largely by the burning of the vehicle body, similar for EVs and ICE. Fire risk is however different, as fuel tanks can cause pool fires and batteries jet fires (flammable gas release). Increasing flammable materials in cars has increased risk of fire spread between vehicles in car parks. Car parks are also more compact. Over twenty years from the 1990's to 2014, car park fires involving more than five vehicles increased from <2% to 14%. Today, fire spreads from one vehicle to a second one in 10 – 20 minutes, but then spread accelerates. Research is underway to improve understanding of battery and EV fires and appropriate fire fighter training and guidance is needed.

"Hazards of EVs in the built environment and firefighting tactics", V. Hutchison, FPRF, USA, in Proceedings from the Seventh International Conference on Fires in Vehicles, Stavanger, Norway, April 24-25, 2023, RiSE *https://www.diva-portal.org/smash/get/diva2:1805310/FULLTEXT01.pdf*

Review of car park fires

Summary of four major fires and eight research fire tests, concludes risks are increasing and fire spread accelerating. Car park fires analysed include Liverpool (2017), Cork (2019), Stavanger airport (2020), Märsta (2021), along with published full-scale fire tests from 1997 to 2022. Increasing vehicle size means that cars are today closer together in car parks, increasing the risk of fire spread and making fire fighting intervention more difficult. Despite increasing use of plastics, fire test results do not show clear correlation to heat release rate. Car fire development depends strongly on behaviour of fuel tanks (which are today plastic) and ventilation (breakage of windows). Recent tests suggest that in some cases electric vehicles may cause fire spread more rapidly than internal combustion engine vehicles. Challenges are identified as new car fuels (electric, hydrogen), increasing car park densification, including stacking systems and self-parking.

"Car Park Fires: A Review of Fire Incidents, Progress in Research and Future Challenges", C. Meraner, in Proceedings from the Seventh International Conference on Fires in Vehicles, Stavanger, Norway, April 24-25, 2023, RiSE https://www.diva-portal.org/smash/get/diva2:1805310/FULLTEXT01.pdf

Testing heat release from car fires

Full scale burn tests on modern diesel engine car shows similar heat release to comparable model from the 1990's. Two test burns of Renault Talisman vehicles were carried out, one with empty fuel tank, one 2/3 full of diesel. Results were compared to a 1990's test of the comparable Renault model of the time, Laguna. Total energy released during the today tests was not significantly different from the 1990's test, around 5000 MJ after half an hour, despite the Talisman weighing 200 kg more than the 1990's Laguna. The peak heat release rate in the 1990's test was significantly higher, nearly 9 MW, but that of the Talisman with 2/3 empty full fuel tank was somewhat higher and earlier than with a full tank. These results suggest that heat release rate is mainly influenced by specific events (time at which windows break letting air into the car interior, fuel tank failure leading to pool fire in the 1990's test).

"Experimental investigation of the HRR of modern ICE vehicles", J-B. Tramoni et al., in Proceedings from the Seventh International Conference on Fires in Vehicles, Stavanger, Norway, April 24-25, 2023, RiSE https://www.diva-portal.org/smash/get/diva2:1805310/FULLTEXT01.pdf

INNOVATION

PIN FR polycarbonate (PC) without PFAS

Avient launches first non-halogenated flame retardant solution for E&E PC which does not need PTFE anti-drip (PFAS). Polycarbonate offers heat resistance, impact strength, stability and aesthetic qualities needed in electronic and electrical equipment. Non-halogenated (PIN) flame retardants can ensure fire resistance, essential for safety in electrical components, in contact with electrical currents with potential for overheating, short circuits or arcing. An important parameter for fire safety is that the polymer should not melt and drip, because this can spread fire. PIN flame retardant systems to date generally use very low doses of PTFE anti-drip (polytetrafluoroethylene, <0.5%), but this chemical is a PFAS (polyfluoroalkyl substances, which for which a Restriction has been announced by the EU, see pinfa Newsletter n°148). Avient's new line of non-PTFE PIN FRs are halogen-free to IEC 61249-2-21 and in PC can achieve GWFI fire performance 960°C). Delivered as FR concentrates, they can be combined with colours and other additives and used with both virgin and recycled polycarbonates.

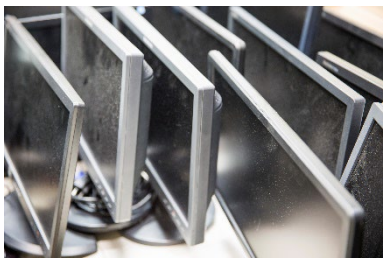
"Avient Unveils PTFE-Free and Non-Halogen Flame Retardants for Polycarbonate at Fakuma 2023", 9 October 2023
https://www.avient.com/news/avient-unveils-ptfe-free-and-non-halogen-flame-retardants-polycarbonate-fakuma-2023

RECYCLING

Non-halogenated WEEE easier to recycle

Post-consumer electronics polymers show better recycling when brominated flame retardants are not present. End-of-life WEEE (waste electrical and electronic equipment) plastics from Finland were sorted by polymer type (using X-Ray Fluorescence XRF) and by bromine content (containing or not brominated FRs). ABS, PC-ABS and PS (polystyrene) fractions were mechanically recycled (crushing, remelt, injection molding) then mechanical properties were tested (melt flow index, tensile strength, tensile modulus). Results showed difficulties sorting polymers in dark-coloured materials, general compatibility of the end-of-life WEEE polymers with recycling. Mechanical properties after recycling were better when polymers were sorted, and were poorer for bromine-containing fractions than for fractions without bromine. Given that these are WEEE polymers, the non-brominated fractions can be expected to contain PIN FRs. Comparison between properties of recycled polymers and virgin polymer compounds is not tested.

"The Effects of Bromine Additives on the Recyclability of Injection Molded Electronic Waste Polymers", V. Lahtela et al., Global Challenges. 2023, 2300157, https://doi.org/10.1002/gch2.202300157



Brominated FRs in WEEE slowly decreasing

Levels of brominated flame retardants in end-of-life electronics are slowly falling, but may hinder recycling and increase costs. Study by DSS+, funded by the bromine industry, notes that Europe generates 2.6 million t/y (2021) of WEEE (waste electrical and electronic equipment) plastics, of which only around 50% is collected through official channels and only around 15% is recycled. Levels of brominated FRs in WEEE plastics from screens have decreased over the last decade (2010-2022) but are stable in WEEE from smaller electronic items. Content of PBDEs (a family of brominated FRs which is now restricted) has decreased but PBDEs are still found because of devices manufactured before restrictions. On average, around 3.5% of WEEE plastics today contain brominated FRs. The study notes that new or proposed lower limits for certain brominated FRs in wastes (HBCD, PBDEs) may hinder WEEE plastics recycling, increasing costs and administrative burdens.

"Brominated Flame Retardants and the Circular Economy of WEEE Plastics. State of Play", DSS+ for the bromine industry (BSEF), September 2023, 90 pages https://www.bsef.com/wp-content/uploads/2023/09/Brominated-Flame-Retardants-and-the-Circular-Economy-of-WEEE-Plastics_FINAL.pdf

RESEARCH

Fire LCA polymer vs. mineral insulation

Greenhouse emissions from polymer insulation in fires are comparable to those from thermal mineral wool insulation. Lifetime average emissions from fires involving polystyrene insulation are calculated to be comparable to those resulting from the inferior thermal performance of glass wool insulation. The LCA estimated increased CO_2 emissions resulting from using the same thickness of (non combustible) glass wool insulation material, based on heating a building using a gas boiler (Italy climate zone E). Cooling energy was not considered. This was compared to estimated increased emissions in fires resulting from polystyrene insulation (presumable non flame retarded). The model does not envisage an increased risk of fire with polystyrene insulation, but estimates increased damage to the building resulting from the increased fire load of the polystyrene, embedded carbon in lost building (reconstruction), plus CO_2 emitted by the burning polystyrene itself, using an estimated probability of a fire happening in a building of 3 fire per thousand buildings per year. Other fire emissions are not considered. Conclusions are that total CO_2 emissions are comparable for the two insulation scenarios if fires are considered.

"Quantitative integration of fire risk with life cycle analysis of building: The case of thermal insulation', R. di Filippo et al., J. Building Engineering 76 (2023) 107124, https://doi.org/10.1016/j.jobe.2023.107124

Phosphorus PIN FRs for safer bus interiors

Tests show phosphorus flame retardants reduce heat release and smoke compared to non-FR or halogenated FR ABS. Neat ABS polymer, a material widely used in bus and coach interiors, was compared to ABS with halogenated and with phosphorus PIN flame retardants (PFRs). 26 different ABS-PFR-synergist compounds were screened, and a compound with 10% AlPi (aluminium diethylphosphinate) and 10% APP (ammonium polyphosphate) was selected as optimal. This PFR-ABS showed <1/5 of peak heat release rate compared to neat ABS (around 1/3 if ABS-halogen-FR) and somewhat lower total smoke production and lower maximum smoke density compared to neat ABS (whereas halogenated FR ABS showed nearly double total smoke production). Further, six commercial bus interior materials meeting the existing bus and coach fire safety regulation UNECE R118 were tested (FR-ABS, and FR-ABS + polycarbonate). These showed high smoke release, smoke gas toxicity, and risk of melting-burning spread of fire. In some cases, presence of halogen FRs led to significant HCl or HBr toxic gas release. The authors conclude that current bus material fire safety regulations are inadequate and do not address smoke and fire gas toxicity.

"Fire safe bus interior materials – flame retardants and the effect on smoke production and smoke gas toxicity", A. Sandinge et al., in Proceedings from the Seventh International Conference on Fires in Vehicles, Stavanger, Norway, April 24-25, 2023, RiSE https://www.diva-portal.org/smash/get/diva2:1805310/FULLTEXT01.pdf

PUBLISHER INFORMATION

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