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Phosphorus, Inorganic & Nitrogen Flame Retardants Association

Your newsletter for non-halogen fire safety solutions n° 118 November 2020

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POLICY


Skatteverket

2020-10-01

Kemikalieskatten har begränsad effekt

Skatteverket och Kemikalieinspektionen har utvärderat kemikalieskatten på regeringens uppdrag och lämnar idag rapporten "Utvärdering av skatten på kemikalier i viss elektronik" till finansdepartementet. Utvärderingen har inte kunnat fastställa

Swedish chemical tax has "limited effect"

The official report evaluating the Swedish chemicals tax finds no evidence it is effective and confirms identified problems. The tax was introduced in July 2017 on most electrical and electronic goods sold in Sweden (white goods, specific electronics such as computers, displays, TV), with tax reductions possible if certain types of flame retardant are not used.

The evaluation of the tax by the Swedish Government Chemical Agency KEMI and the Swedish Tax Agency concludes that most electrical goods retailers have not changed their policy, that it is difficult to distinguish effects of the tax from other chemical regulations, and that it is not possible, to date, "*to establish that the presence of chlorine, bromine and phosphorus in flame retardants has decreased in people's home environment as a result of the tax*".

The agencies' report says that the tax is "*not cost-effective*", has increased prices for consumers, is administratively burdensome for companies. It suggests that the chemical substance should be taxed, not as at present the weight of the product, and that the references to "additive" FRs should be clarified. The agencies conclude "*there is reason to review the tax structure regarding the groups of substances taxed. … The group containing phosphorus and the group of alternative flame retardants are less uniform and contain substances that show great variation in terms of hazard properties.*"

The Swedish Tax Agency has published the report under the title "*The chemical tax has limited effect*". Since its announcement and implementation, the tax is criticised by stakeholders, ranging from the electronics industry to NGOs, e.g. IT&Telekomföretagen, TCO Development ecolabel, Hewlett Packard (pinfa Newsletter n°106), ChemSec (n°101), and a recent study by Chalmers Technical University (n°117). KEMI and Skatteverket will now prepare a second study to propose changes to the current ecotax by march 2021.

Swedish tax Agency (Skatteverket) publication of the report "Evaluation of the tax on chemicals in certain electronics", report Fi2019 / 04008 / S2, 1st October 2020
https://www.skatteverket.se/omoss/press/nyheter/2020/nyheter/kemikalieskattenharbegransadeffekt.5.569165a01749e7ae789e31.html?fbclid=Iw%E2%80%A6

Comment on IT&Telekomföretagen website https://www.itot.se/2020/10/kemikalieskattens-vara-eller-icke-vara/

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European Parliament underlines fire safety

Fire safety, including selection of materials in construction and renovation, is cited in the EP position on the Renovation Wave. Parliament calls (§46) to include fire safety aspects, including design, materials, fire detection and suppression, fire-fighting and competence of building professionals. Parliament specifically calls (§63) on the European Commission to launch a skills and information initiative to support … quality, compliance and safety. Parliament's text covers many aspects of building renovation including communities, finances, technologies and building materials, standards, skills, healthy buildings and data.

European Parliament text adopted 17th September 2020
https://www.europarl.europa.eu/doceo/document/TA-9-2020-0227_EN.html

EU consultations

Pollutant Release and Transfer Register: open to 26 October 2020. The E PRTR Regulation (EC) 166/2006 currently covers emissions of 91 listed pollutants for installations in 65 sectors. Listed pollutants currently include certain halogenated FRs (PBDEs, HBBB, chlorinated paraffins C_{10}-C_{13}).

EU public Roadmap consultation on the European Pollutant Release and Transfer Register (E PRTR) HERE

EU consultation on Zero Pollution Ambition: open to 29 October 2020. The "EU Action Plan Towards a Zero Pollution Ambition for air, water and soil" stems from the Green Deal. The consultation Roadmap document refers to persistent and toxic chemicals and to micro-plastics, amongst other challenges and micro-plastics, and suggests strengthening implementation and enforcement, improving existing environmental legislation *acquis* including widening to protecting soil, to better governance and to sustainable consumption.

EU public Roadmap consultation on the Zero Pollution Ambition HERE

Sustainable Products Initiative: **open to 2nd November 2020**.

See pinfa Newsletter n°117. *https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12567-Sustainable-Products-Initiative*

Construction Products Regulation (CPR): open to 22nd December 2020. EU public consultation, requesting opinions on different orientations and options for the coming review of the CPR. The consultation has a short general public questionnaire and a detailed technical questionnaire.

See pinfa Newsletter n°117. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12458-Review-of-the-Construction-Products-Regulation/public-consultation

FIRE SAFETY

NFPA US Fire Loss Report 2019

Despite slow improvements, there were nearly 1.3 million fires in the USA in 2019, but vehicle fires are increasing, causing 17% of fire deaths. Fire killed nearly 3 700 civilians and injured 16 000. Three quarters of fire deaths and injuries were home fires. Although overall home fires continued to decline, deaths and injuries in on or two family homes (i.e. not in apartments) increased. Property loss is not comparable, because of wide annual variations in wildfire losses, but fires involving buildings (around half of all fires) showed an 11% increase in fire property damage from 2018 to 2019 (12.3 Billion US$ in 2019). The average property loss per structural fire was 45% higher in 2019 than in 1980 (inflation adjusted). Vehicle fires (mainly road vehicles) were 17% of all fires, causing also 17% of all deaths and 2.2 billion US$ property losses.

"Fire Loss in the United States During 2019", M. Ahrens, B. Everts, NFPA, September 2019 https://www.nfpa.org/News-and-Research/Data-research-and-tools/US-Fire-Problem/Fire-loss-in-the-United-States

FEEDS White Paper: new electrical fire risks

White Paper says electrical fires are increasing and points to new risks from PhotoVoltaics, ElectricVehicles, heat pumps and the ageing population. FEEDS (Forum for European Electrical Domestic Safety) says there are over 270 000 fires of electrical origin in the EU, that is nearly one third of domestic fires, causing 1 to 2 000 deaths and over 6 billion € property damage yearly. Electrical fire risks are proliferating. An ageing population leads to new electrical installations, from chair lifts to safety alarms. Local photovoltaic electricity generation (PV) brings specific new risks, as do renewable energy installations (e.g. heat pump compressors) and electrical vehicle charging (EV). All these developments increase electrical circuit loads, accentuating risks, whereas most EU homes have electric installations more than 25 years old.

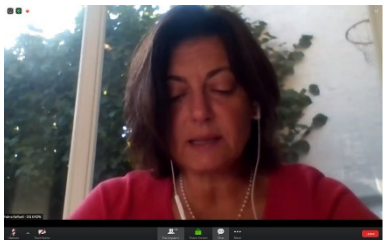
"White paper. Residential electrical safety. How to ensure progress", Forum for European Electrical Domestic Safety. March 2020. https://www.feedsnet.org/#h.p_yx4F7usI0mwl

WEBINARS AND COMMUNICATIONS

Sustainable fire safety solutions

Non-halogen flame retardants are needed for sustainability trends such as clean energy or wood construction, said Maggie Baumann, FRX Polymers and pinfa-na at CAMX, the Composites and Advanced Materials Expo. The presentation, online here, shows that FRs are growing 6 % in Automotive and a compounded rate of 3.6-3.7% overall per year (BCC and GrandviewResearch.com), nearly twice as fast as overall speciality chemicals. Fire safety is a societal demand, and essential for sectors such as electronics, electric vehicles, timber construction, thermal insulation, etc. FR chemicals are innovating fast, principally in non-halogens, to enable fire safety in new materials with improving environmental and health profiles, with major new commercially successful products over the last 20 years. These are validated by 3rd party assessments or ecolabels such as GreenScreen or TCO.

"Working toward more sustainable fire safety solutions", M. Baumann, pinfa-na at CAMX 2020, 21-24 September 2020 virtual https://84f03413-c13d-4e90-9e4d-2faa848203db.filesusr.com/ugd/c82d2b_5d6d3a3ee60f4010a88d730e55acbef7.pdf



MEP webinar promotes fire safety action

Pernille Weiss (S&D, Denmark) and Carlos Zorrinho (S&D, Portugal) called for more action on fire safety at a webinar organised by the European Fire Safety Alliance. The MEPs underlined the increasing vulnerability of an ageing population and the increased domestic fire risk with home working under Covid. René Hagen, IFV Netherlands and firefighter underlined that fires today produce massively more smoke, giving less time to escape. Fulvia Raffaeilli (photo) and Heikki Vänännänen, DG GROW, underlined the importance of including fire safety in building energy "Renovation Wave". They announced a Commission JRC study launched to survey and compare fire safety engineering standards and training across Member States. Felix Bloch, DG ECO, explained that the EU is developing a network of civil protection actors across Europe, which will provide a space for exchange between fire services and stakeholders. Quentin de Hults, Modern Building Alliance, underlined the need to improve training and accreditation of experts in fire safety design and verification. He called for a strong action in Horizon Europe on building fires. Benoït Dome, FEEDS (see in this Newsletter) underlined that the proliferation of electrical equipment increases fire risk, and that this will accelerate with 5G.

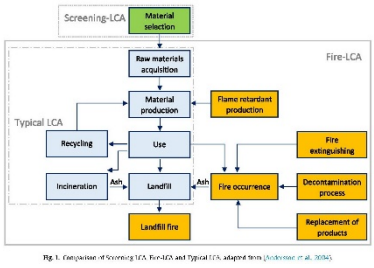
Webinar, 29th September 2020
https://www.europeanfiresafetyalliance.org/news/lets-improve-european-fire-safety-mep-event-29th-of-september/

MEPs call for building fire standards

Tanja Fajon (S&D, Slovenia) and Sirpa Pietikaïnen (EPP, Finland) called to ensure fire safety in building renovation in EU Renovation Wave investments at a webinar on the EU Green Deal and fire resilient buildings. They underlined the need for demanding building fire standards, and for their implementation, including in building renovation and maintenance, noting the need to build relevant professional fire safety competence. Other speakers included Margaret McNamee, Lund University and Ivo Jaanisoo, Estonia Ministry of Economic Affairs, who both underlined the specific fire safety challenges of green buildings, including timber construction. The webinar also discussed the need to address environmental impacts of fires, both immediate risks of smoke toxicity and overall pollution emissions from accidental fires.

Digital Roundtable: Boosting the EU Green Deal with fire resilience, 30th September 2020 https://firesafeeurope.eu/digital-roundtable-on-boosting-the-eu-green-deal-with-fire-resilience/ *Watch on YouTube* https://www.youtube.com/watch?v=wMomAeASSbc

FLAME RETARDANT LIFE CYCLE ANALYSIS



Review of LCAs of flame retardants

LCAs conclude benefits of PIN FRs but further LCA work is needed to support substitution of halogenated FRs. Samani et al. reviewed FR LCAs, finding only two LCAs specifically comparing flame retardants (Jonkers 2016 – summarised in pinfa Newsletter n° 58, Deng 2016, see below), both of which conclude significant LCA benefits in replacing halogenated by PIN FRs. Several other LCA studies were identified comparing products with / without FRs (Broeren 2016, Dahllöf 2004, Yasin 2018 – these are summarised below). The review concludes that there is a "huge gap" in LCA data on flame retardants, and more generally on plastic additives. They underline that LCAs of PIN flame retardants should be developed to support substitution away from halogenated FRs, considered to pose environmental concerns and progressive regulatory prohibition. LCAs should take into account impact of fires (pollution, materials destroyed).

pinfa's analysis of the few LCAs identified by Samani et al. (plus one other recent paper) shows that the only two of these provide an LCA comparison between PIN and halogenated FRs: Jonkers 2016 (see pinfa Newsletter n° 58) showed that the largest LCA difference was in the end-of-life phase, with PIN FRs having a preferable LCA; Deng (below) shows preferable LCA for PIN compared to brominated FR.

Ingrao et al. 2020 have published an LCA of nano hydroxyapatite (calcium phosphate) as a PIN flame retardant for leather. They suggest that it would be effective because the hydroxyapatite, which is the same main chemical as bone structure, could bind to collagen present in leather, but no data is included to support this. The hydroxyapatite was lab synthesised by reacting lime with phosphoric acid, resulting in particles c. 100-

150 nm length, 5-10 nm thickness. LCA for these raw materials were taken from Ecoinvent. Conclusions are that the main LCA environmental contributions are related to phosphoric acid, but that this depends on the supply chain. No account is taken of possible environmental impacts of fires. The LCA of hydroxyapatite is not compared to other fire safety treatments.

Broeren et al. 2016 compared LCA for a printer panel produced from bio-sourced polymer (PLA) to petro-sourced PP, ABS, PC/ABS, in formulations with or without flame retardants (type of FR not specified). Plastic additive production contributed significantly to LCA, e.g. up to 40% of greenhouse gas emissions. In the only comparable case, PC/ABS with FR (V0) showed higher environmental impacts and higher cost, but was not fire performance classified without FR.

Dahllöf, 2004, produced a report on LCA methodology for textiles, applied to furniture. This compared FR polyester (Trevira CS, phosphorus based) to non-FR cotton and to 85% wool / 15% polyamide PA66. This showed the lowest energy consumption for the Trevira textile (646 MJ for the textile for a 3-seat sofa, 928 MJ for cotton, 1115 MJ for wool/PA). The Trevira also showed lower global warming potential, acidification, eutrophication, water use, chemical use (mainly because of agro-chemicals in growing the cotton and wool) and ecotoxicity and human toxicity both nearly equal lowest, so lowest overall environmental impact.

Yasin et al. 2018, assessed the LCA of an FR cotton curtain (phosphorus FR, not specified, but probably by reference to Yasin 2016: MDPA N-methylol dimethyl phosphonopropionamide plus TMM = trimethylol melamine) comparing two end-of-life scenarios. Results show that end-of-life makes only a minor contribution to LCA, with manufacturing and use phases contributing around half each of e.g. greenhouse impact. The paper does not compare FR with non-FR and only assesses the one type of FR.

Deng et al. 2016, compared LCA of two printed circuit boards: PIN FR (melamine polyphosphate) in a bio-sourced substrate (flax fibres in epoxidized linseed oil), brominated FR (TBBPA) in conventional epoxy resin / glass fibre substrate. Results show considerably lower overall LCA for the bio-sourced + PIN combination, in particular much lower climate change, human toxicity and particulate matter formation impacts. The PIN flame retardant alone shows considerably lower LCA impact than the halogenated FR (fig. 3) and lower climate change and human toxicity (figs. 4 and 5). The authors note the brominated FR's high terrestrial and marine ecotoxicity.

"Life cycle assessment (LCA) studies on flame retardants: A systematic review", P. Samani et al., Journal of Cleaner Production 274 (2020) 123259
https://doi.org/10.1016/j.jclepro.2020.123259

"Chemistry behind leather: Life Cycle Assessment of nano-hydroxyapatite preparation on the lab-scale for fireproofing applications", C. Ingrao et al., J. Cleaner Production, vol. 279, 10 January 2021, 123837 https://doi.org/10.1016/j.jclepro.2020.123837

"Methodological Issues in the LCA Procedure for the Textile Sector. A case study concerning fabric for a sofa", L. Dahllöf, ESA Sweden, 2004, ISSN 1404-8167
http://cpmdatabase.cpm.chalmers.se/DataReferences/ESA_2004--7.pdf

"Life cycle assessment of flame retardant cotton textiles with optimized end-of-life phase", S. Yasin et al., J. Cleaner Production 172 (2018) 1080e1088
https://doi.org/10.1016/j.jclepro.2017.10.198

"Life cycle assessment of flax-fibre reinforced epoxidized linseed oil composite with a flame retardant for electronic applications", Y. Deng et al., J. Cleaner Production 133 (2016) 427e438
http://dx.doi.org/10.1016/j.jclepro.2016.05.172

"Early-stage sustainability assessment to assist with material selection: a case study for biobased printer panels", M. Broeren et al., J. Cleaner Production 135 (2016) 30e41
http://dx.doi.org/10.1016/j.jclepro.2016.05.159

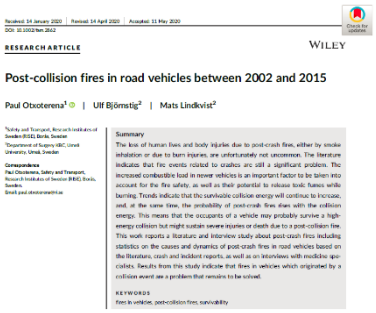
RESEARCH

Flammability of bus ceilings

Three ceiling materials from Zhongtong Bus, China, showed significant heat release within a minute at heat flux 25 kW/m^2. The three materials consisted of a PVC covering with backing materials (1) polyethylene + polypropylene, (2) non-woven fibre + plywood and (3) rigid polyurethane foam. Heat release rate was highest for the backing material (1), but the PVCs in the materials also had different fire behaviours significantly influencing overall fire reaction. The authors note that ceiling materials can contribute to spread of fire through the whole bus, and that fire performance of both surface and backing materials are important.

3Pyrolysis characters and fire behavior of bus ceiling materials", J. Wang et al., Journal of Thermal Analysis and Calorimetry 2020
https://doi.org/10.1007/s10973-020-10171-6

Burning bus picture: Adrian Beard



RESEARCH ARTICLE

WILEY

Post-collision fires in road vehicles between 2002 and 2015

Paul Otxoterena[1] | Ulf Björnstig[2] | Mats Lindkvist[2]

Summary

The loss of human lives and body injuries due to post-crash fires, either by smoke inhalation or due to burn injuries, are unfortunately not uncommon. The literature indicates that fire events related to crashes are still a significant problem. The increased combustible load in newer vehicles is an important factor to be taken into account for the fire safety, as well as their potential to release toxic fumes while burning. Trends indicate that the survivable collision energy will continue to increase, and, at the same time, the probability of post-crash fires does with the collision energy. This means that the occupants of a vehicle may probably survive a high-energy collision but might sustain severe injuries or death due to a post-collision fire. This work reports a literature and interview study about post-crash fires including statistics on the causes and dynamics of post-crash fires in road vehicles based on the literature, crash and incident reports, as well as on interviews with medicine specialists. Results from this study indicate that fires in vehicles which originated by a collision event are a problem that remains to be solved.

KEYWORDS

fires in vehicles, post-collision fires, survivability

Vehicle trends make fire an increasing risk

The percent of road accident fatalities in burning vehicles is increasing, accentuated by materials and technology trends. A study based on data from the USA, UK and Sweden, interviews with medical experts and assessment of accident reports, shows that although the total number of road vehicle accidents is decreasing, the proportion of accidents involving fires is increasing, as is the % of road accident fatalities linked to fire. Newer cars show a similar fire rate to older vehicles. Fire rates are linked to energy absorption. The authors note that modern vehicles have an increasing fire load, as plastics and composites are used to reduce weight, and that safety design means passengers are more likely to survive high-energy absorption crashes (survivable collision energy increases). The authors conclude that vehicle fires remain a significant problem, likely to be accentuated in the future, and that more data is needed on road vehicle fires and on smoke and toxicity of new vehicle materials.

"Post-collision fires in road vehicles between 2002 and 2015", P. Otxoterena et al., Fire and Materials. 2020;1–9,
https://doi.org/10.1002/fam.2862

Environmental impact of fires in buildings

NFPA report shows better data and more research are needed on pollutant emissions and rebuild impacts of accidental fires. The report assessed literature today available on pollutants released by fires in the built environment, to water runoff, in the contamination plume from the fire, and resulting from replacement and rebuild of destroyed or damaged property, including a number of case studies of real fires. Conclusions are that most available information concerns gas emissions during fire, with little on emissions to water or fallout to soil, or on impacts of firefighting choices. The report concludes that more data is necessary, and research is particularly necessary into policy framing, modelling fire effects and modelling economic costs of fire environmental impacts.

"Research Roadmap: Environmental Impact of Fires in the Built Environment", M. McNamee et al., NFPA Research Foundation, February 2020, report n° FPRF-2020-02 https://www.nfpa.org//-/media/Files/News-and-Research/Fire-statistics-and-reports/US-Fire-Problem/RFRoadmapEnvironmentalImpactFires.pdf

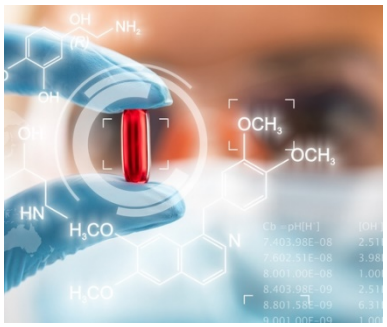
A PIN FR package in epoxy shows aviation fire performance and reduced smoke emission and toxicity. DGEBA-based epoxy was combined with FRs, then applied to woven glass fibres (GF) to 0.6 mm thickness. A PIN flame retardant package (resin micro-encapsulated red phosphorus + zinc borate + aluminium tri hydroxide) was assessed, testing addition of each component separately in the GF-resin, and with combinations up to 52% total FR loading. At total loading of the PIN FR package around 30%, peak heat release rate (PHRR) was reduced by over 50% and also delayed in time (compared to neat GF-epoxy). Self-extinguishing was achieved in the vertical burn test and burn length reduced by around two thirds. Smoke density was increased by the PIN FR package compared to neat GF-epoxy, but could be reduced by adding zinc borate or aluminium trihydroxide only. Smoke toxicity (Microtox cytotoxicity test) was lower with the PIN FR package than for neat GF-epoxy.

"Cleaner production of flame-retardant-glass reinforced epoxy resin composite for aviation and reducing smoke toxicity", F. Özmen et al., J. Cleaner Production 276 (2020) 124065 https://doi.org/10.1016/j.jclepro.2020.124065

3D-printing modifies fire performance

Tests show that 3D-printed polycarbonate with and without PIN FRs show different fire performance results than granules. 3D-printable polycarbonate (Covestro) was tested with two different transparency-compatible PIN FR masterbatches (Gabriel-Chemie) then extruded to 1.75 mm diameter 3D-printing strands. Fire testing was carried out on both the unprinted strands (cut to granules) and on a 3D-printed sample (railway LED light component), printed by FDM (fused deposition modelling), nozzle temperature 300°C. Neat polycarbonate achieved UL94-V0 at 25% but only V1 at 50% printing density. The PIN FRs reduced peak heat release rate for the unprinted polycarbonate by -15% to -19%, but after printing, the PIN-FR-polycarbonate failed UL94 or achieved only V1 at low printing density, but could (in some cases) achieve V0 at printing density 50% - the reverse of the neat polycarbonate. The authors conclude that print parameters and FR selection require specific solutions for 3D-printing.

"Influence of 3D-Printing on the Flammability Properties of Railway Applications Using Polycarbonate (PC) and Polylactic acid (PLA)", D. Hohenwarter et al., Problemy Kolejnictwa, Issue 187 (June 2020), pp. 99-107, https://doi.org/10.36137/1874E



Overview of sustainable flame retardants

PIN FRs, including with bio-sourced materials, provide a diverse range of sustainable fire safety solutions for the future. This review from Canada considers halogenated flame retardants and antimony trioxide as problematic and presents minerals and nanoclays, nitrogen, intumescent, silicone and phosphorus-based FRs as future research routes. Bio-based PIN FRs are possible by reacting these onto hydroxy groups on natural molecules (such as cellulose, lignin, tannin, polysaccharides) or combination with natural molecules which themselves bring FR properties (e.g. proteins, DNA). Sustainable FR solutions are considered necessary to respond to societal demand for fire safety, in particular buildings safety standards, at the same time as increasing electrical and electronic products worldwide.

"Development of sustainable flame-retardant materials", T. Ngo, Green Materials, Volume 8, Issue 3, Themed Issue: Sustainable flame retarded materials https://www.icevirtuallibrary.com/toc/jgrma/8/3 paper 1900060 https://doi.org/10.1680/jgrma.19.00060


Environment International

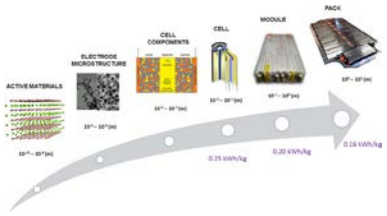
Review article

Phasing-out of legacy brominated flame retardants: The UNEP Stockholm Convention and other legislative action worldwide

Phasing out of certain brominated FRs

A review summarises progress in banning “legacy” brominated FRs and questions posed by other “novel” brominated FRs. Implementation of the Stockholm POP (Persistent Organic Pollutants) Convention, as applicable to brominated flame retardants (BFRs) is analysed. This Convention today lists PBDEs, HBCD and HBB. These are now almost entirely prohibited, or this is underway, in e.g. Europe, China, Japan. The USA has not signed the Stockholm Convention, but thirteen States have already taken actions. The paper notes the challenges posed by presence of these listed POP BFRs in waste streams, posing an obstacle to recycling, and with risk of their accidental presence in recycled materials. The paper notes that the use of other (“novel”) BFRs poses difficulty for screening of these listed POP BFRs in recycling streams, and questions whether brominated replacements may not also be banned in the future.

“Phasing-out of legacy brominated flame retardants: The UNEP Stockholm Convention and other legislative action worldwide”, M. Sharkey et al., Environment International 144 (2020) 106041
https://doi.org/10.1016/j.envint.2020.106041



Lithium-ion battery fire safety

Flame retardants are a key protection technology to reduce the specific problem of lithium-ion battery fires. Fires in lithium ion batteries (LIB) are uncommon, but are of concern because such batteries are ubiquitous, with increasingly large units such as in electricity storage or electric vehicles. LIB fires pose specific risks in terms of initiation, spread, duration, toxicity and extinction. Fire risks in LIB can result in massive product recalls. The authors note that significant research has been engaged in battery thermal runaway and battery components but is lacking concerning fire protection at the module scale, preventing spread between battery cells and units. Key protection technologies cited include flame retardants included in battery electrolytes and fire-resistant separations between cells (compartmentalisation). The authors underline the need for fire statistics, for full-scale fire testing and for development of LIB fire safety standards.

“Review—Meta-Review of Fire Safety of Lithium-Ion Batteries: Industry Challenges and Research Contributions”, L. Bravo Diaz, Electrochemical Society, 2020 167 090559 https://doi.org/10.1149/1945-7111/aba8b9

OTHER NEWS

FRs found in monkey faeces: A total of 60 faeces samples from primates (captive in Indiana, wild in Costa Riva and Uganda) were tested for 40 pesticides, 52 halogenated FRs and 12 non-halogenated organophosphorus FRs (non-H OPFRs). Only three non-H OPFRs were found in >60% of samples and sum total OPFRs (inc. halogenated) ranged from 50 to 2 900 ng/g lipid (lipid was 0.001 to 0.09 of faeces). Levels of all sampled chemicals varied widely between both primate species and location, with higher levels found in herbivorous species. There is no indication that the levels of OPFRs found pose health risks for the primates.

Organophosphorus metabolites in urine during pregnancy correlated to infant parameters: in a small sample (52 mother – child pairs only), two chlorinated (BCEP, BDCPP) and one non-halogenated (DPHP diphenyl phosphate) metabolites in urine during pregnancy showed correlations to infant weight, anthropometry and behaviour. Each of the three metabolites showed correlation to some factors, often sex specific but the authors note that the small sample size means that results should be considered as hypotheses. Also, DPHP is a metabolite not only of OPFRs but also of OPs used in many other applications (plasticisers, nail varnish).

GreenScreen Standard for Furniture and Fabrics: US NGO Clean Product Action has launched a GreenScreen Certified Standard for "Furniture and Fabrics". This excludes (A4.4) all flame retardants defined as "*Any chemical or chemical compound for which a functional use is to resist or inhibit the spread of fire*" (limit 1000 ppm in all homogenous parts), except in electronic components where only halogenated FRs are excluded (A4.5).

"Feces are Effective Biological Samples for Measuring Pesticides and Flame Retardants in Primates", S. Wang, Environ. Sci. Technol. 2020, https://dx.doi.org/10.1021/acs.est.0c02500

"Maternal urinary concentrations of organophosphate ester metabolites: associations with gestational weight gain, early life anthropometry, and infant eating behaviors among mothers-infant pairs in Rhode Island", K. Crawford et al., Environmental Health (2020) 19:97 https://doi.org/10.1186/s12940-020-00648-0

GreenScreen Certified™ Standard for Furniture & Fabrics https://www.greenscreenchemicals.org/certified/furniture-fabrics

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) www.pinfa.org. 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

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