pinfa
Phosphorus, Inorganic & Nitrogen Flame Retardants Association

Your newsletter for non-halogen fire safety solutions n° 126 May 2021

EU PUBLIC CONSULTATIONS

Sustainable Products Initiative

Sustainable Products Initiative public consultation: open to 9th June 2021. One of several regulatory developments engaged as part of the Green Deal. See pinfa Newsletter n°125.

Sustainable Products Initiative – EU general public consultation. ***Open to 9th June 2021*** *https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12567-Sustainable-Products-Initiative/public-consultation*

REACH and CLP

Public consultation, to 1st June 2021, on the Roadmap for revision of EU chemicals regulations REACH and CLP. This revision is a key first stage of rollout of the EU Chemicals Strategy for Sustainability (see pinfa Newsletter n°119), within the Green Deal. The Roadmap proposes to add new, or extend existing, "hazard classes" for carcinogenicity, neurotoxicity, immunotoxicity and endocrine disruption; that REACH dossiers should assess combination exposure to multiple substances (Mixture Assessment Factor MAF); to oblige registration for certain polymers; to require Environmental Footprint information in REACH dossiers; to improve supply chain communication; to accelerate and simplify the "Authorisation" process for ("candidate List" chemicals) and the Restriction process (possible generic risk approach for endocrine disruptors, PBT/vPvB, immunotoxicants, neurotoxicants, respiratory sensitisers, substances which affect specific organs) and to reinforce control and enforcement, including for imported articles.

Public consultation on revision of REACH and CLP, ***open to 1st June 2021*** *https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12959-Chemicals-legislation-revision-of-REACH-Regulation-to-help-achieve-a-toxic-free-environment_en*

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PINFA-NA FORMULATORS' WORKSHOP

The full programme of the pinfa-NA SPE (Society of Plastics Engineers) online formulators' training is now published. The four workshop sessions are led by expert instructors, with possibilities to ask questions and dialogue. The training will address fire behaviour of materials and fire safety tests, non-halogenated flame retardant chemistry and selection, formulation of elastomers, thermosets, textiles, coatings and other materials, new developments and sustainability.

Four training sessions: ***1st, 8th, 15th, 21st June 2021.***
Registration https://www.4spe.org/i4a/pages/index.cfm?pageid=6482

PINFA – SAMPE TRANSPORTATION WEBINAR

Webinar on transportation composites

Summary of pinfa-NA – SAMPE online event on new challenges for materials fire safety in aircraft.

Event page:
https://www.naSAMPE.org/events/EventDetails.aspx?id=1496426

Watch the recording of the webinar on the SAMPE YouTube channel : direct link here https://www.youtube.com/watch?v=LHVzhuYcT30

Tim Reilly, Clariant and **Maggie Baumann, FRX Polymers**, opened the webinar, welcoming over 150 participants, and underlining the fire-safety success of air and rail travel, where billions of passengers travel worldwide today with very high levels of safety.

Raj Manchanda, SAMPE (Society for the Advancement of Material and Process Engineering) underlined the high and accelerating rate of innovation in materials in transport applications, with non-halogen flame retardants playing a key role in enabling new materials. Tomorrow's challenges include bringing high production rates from the automotive to train and aircraft industries.

Join the SAMPE Materials Innovation & Advanced Technology Leadership Forum, 26-27 January 2022.

Jeff Gardlin, US Federal Aviation Authority, outlined perspectives for fire standards for aviation and the challenge of enabling innovation whilst ensuring the ever increasing safety levels expected by the public. Research needs to address in parallel materials and technology innovation and appropriate safety standards. Standards need to be sufficiently precise to be demanding, but flexible to accommodate new materials. New challenges for fire safety will include 3D-printed materials, which may have different fire performance, and fire risks related to batteries.

John Harris, Boeing, presented results of extensive testing of resistance to UV-C light (222 nm), a potential solution for COVID virus disinfection of materials and surfaces. In a wide range of aircraft cabin materials, extended exposure to light intensity equivalent to repeated disinfection over twenty years showed little impact on mechanical properties or on flammability, but significant discoloration of some material (yellowing of white materials as widely used in aircraft cabins).

Further details and information are here
https://www.boeing.com/confident-travel/?gclid

Thomas Fabian, UL, presented results of an internal UL testing programme comparing fire and electrical performance of two 3D filament printed materials to the same materials when injection moulded: non-halogenated flame retardant ABS, PEI (polyetherimide, an inherently fire resistant polymer). Results show lower fire and electrical performance (e.g. UL94, HWI, tracking index) in 3D-printed compared to injection moulded material. This may be related to higher surface roughness and air gaps (chimneys) in the materials structure. Results show considerable variation depending on printer settings, orientation, and even on the printer model for the same parameters. In addition to the Yellow card, UL has developed the UL Blue Card which addresses this by specifying in the test results both printer parameters and printer model.

Bhaskar Biswas, Safran Cabin, aircraft interior developer and provider with 80 years' experience and global leader in several markets including cabin liners and galleys, summarised the types of testing protocol used to achieve fire security. FAA requirements pose stringent requirements for ignition, burning intensity, material integrity in fire and smoke density. These requirements drive materials selection and component design. For composites, three tests are key: vertical flammability, heat release (OSU) and smoke density. In general, these tests are performed for composites, using samples of application-specific configuration, at different levels of structural assemblies from materials to sub-component and components.

Matthew Blais, SwRI summarised results of room fire tests comparing UK furniture (non-halogen flame retarded) to French or US (non flame retardant), see pinfa Newsletter n°104. These full-scale tests show that UK furniture delays flashover from 2-4 minutes to 17-22 minutes, with also smoke obscuration similarly delayed. Lethal toxicity is reached in around 7 minutes with the non-FR furniture, whereas the FR-furniture showed little toxicity even after 20 minutes. Carcinogenic smoke components remained much lower with the FR-furniture, even after flashover. Recent room tests have confirmed these results in a well ventilated room, whereas the previous tests used a closed room. The FR materials generate lower smoke and make fires more survivable.

Thomas Chapin, UL, explained how and why batteries pose an increasing fire risk for air transport. Fatal accidents have already been caused by battery fires on aircraft, but the problems are accelerating fast, with increasing use of batteries, and bigger, more

energy-dense batteries. Battery cargo is forbidden in passenger aircraft, but reverse logistics often mean that batteries are transported without indication on the packaging: returns, repairs, recycling. The US CSPC (Consumer Safety Protection Commission) has made 150 product recalls for batteries, concerning 21 million batteries, since 1990. Many of these recalled batteries are transported on aircraft, including batteries which are damaged or faulty. Advancements in flame retarded, lightweight, advanced materials for battery packaging and for transport containers are an important route for improving safety.

Event page:
https://www.naSAMPE.org/events/EventDetails.aspx?id=1496426

POLICY

UL furniture fire safety & chemicals guide

New UL Guide provides detailed information on fire risks, fire protection and flame retardants for upholstered furniture. "Managing Fire and Chemical Exposure Risks of Residential Upholstered Furniture" provides over 40 pages of detailed information (over 110 references) on fire risks of upholstered furniture in the home, flame retardants used in furniture, risk and exposure, fire tests and solutions for fire safety including inherently low flammability textiles and fillings, flame retardants and active and passive fire barriers. The document notes that upholstered furniture is still today the most common first item ignited for residential fire deaths, and that the death rate from furniture fires is increasing. Modern furniture fabrics, blending synthetic and natural fibres, are more flammable than either pure natural or pure synthetic textiles. Polymeric and reactive flame retardants and fire barriers are indicated as technologies to limit chemical exposure. The Guide indicates (§3.3.4) that fire barriers can be effective in protecting upholstered furniture, but may be insufficient to delay burning rate adequately to allow occupant escape and fire service response before flashover, especially if pyrolysis products cross the barrier.

"Managing Fire and Chemical Exposure Risks of Residential Upholstered Furniture", Chemical Insights (an institute of Underwriters Laboratories) with the "Sustainable Furnishings Council"
https://sustainablefurnishings.org/, UL 118F, 21st April 2021
https://www.eurekalert.org/pub_releases/2021-04/uli-cip042121.php

ECHA publishes CoRAP to 2023

EU chemicals action plan includes eight active evaluations of halogenated FRs or their synergists and four of PIN FRs. The European Chemicals Agency, ECHA, has published the Community Rolling Action Plan (CoRAP) update 2021-2023, listing chemicals for Evaluation (under REACH) during this period. In total, the CoRAP evaluation list now contains 392 chemicals, including the following flame retardants:

Flame retardants on ECHA CORaP list for evaluation, as at April 2021			
Halogenated flame retardants and their synergists		**EINECS #**	**Evaluation status**
Diantimony trioxide		215-175-0	Information requested
1,1'-(ethane-1,2-diyl)bis[pentabromobenzene]	EBP	284-366-9	Information requested
1,1'-(isopropylidene)bis[3,5-dibromo-4-(2,3-dibromo-2-methylpropoxy)benzene]		306-832-3	Ongoing
1,1'-(isopropylidene)bis[3,5-dibromo-4-(2,3-dibromopropoxy)benzene]	FR720	244-617-5	Ongoing
2,2',6,6'-tetrabromo-4,4'-isopropylidenediphenol, oligomeric reaction products with Propylene oxide and n-butyl glycidyl ether		926-564-6	Information requested
2,2,6,6-tetrabromo-4,4-isopropylidenediphenol	TBBPA	201-236-9	Information requested
2,2-dimethylpropan-1-ol, tribromo derivative; 3-bromo-2,2-bis(bromomethyl)propan-1-ol	*TBNPA*	*253-057-0*	*Withdrawn*
2,4,6-tribromophenol	TBrP	204-278-6	Concluded
Bis(2-ethylhexyl) tetrabromophthalate	TBPH	247-426-5	Concluded
N,N'-ethylenebis(3,4,5,6-tetrabromophthalimide)	EBTBP	251-118-6	Suspended
Alkanes, C14-17, chloro (Medium chain chlorinated paraffins)	MCCP	287-477-0	Concluded
Reaction products of phosphoryl trichloride and 2-methyloxirane	TCPP	807-935-0 (237-158-7)	Not started
Tris[2-chloro-1-(chloromethyl)ethyl] phosphate	TDCP	237-159-2	Not started
Phosphate esters			
Reaction mass of 3-[(diphenoxyphosphoryl)oxy]phenyl triphenyl 1,3-phenylene bis(phosphate) and tetraphenyl 1,3-phenylene bis(phosphate)	RDP	701-337-2 (260-830-6)	Not started
Phenol, isopropylated, phosphate (3:1)	PIP	273-066-3	Ongoing
Tributyl phosphate	TBP	204-800-2	Concluded
Triphenyl phosphate	TPP	204-112-2	Information requested
Triphenyl phosphite		202-908-4	Concluded
Tris(methylphenyl) phosphate		809-930-9	Conclusion under preparation
Trixylyl phosphate	TXP	246-677-8	Follow-up
Other PIN FRs			
Dipotassium tetraborate	Borax	215-575-5	Concluded

ECHA CoRAP List update 17th March 2021
https://echa.europa.eu/documents/10162/9801478/corap_update_2021-2023_en.pdf/fdb46fb0-21a2-1ab7-3ce2-74dbe509a60f and full CoRAP list of 392 substances subject to Evaluation
https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table

Ecolabel / GPP for photovoltaic systems

EU (JRC) report on PV notes the need for fire safety of cables and panel backings and the availability of acceptable PIN FRs. The European Commission (JRC) preparatory report on possible Ecolabel and/or Green Public Purchasing criteria for photovoltaics notes that some existing warranty systems require fire classification of cables and panel backings and reporting of halogen content, and that FRs are relevant for internal electrical components for inverters and junction boxes. The report cites pinfa in identifying alternatives to chlorinated materials or brominated FRs. It also points to six specific PIN FRs which are already 'derogated for use' in other EU Ecolabels (DOPO, aryl alkylphosphinate, MDH+zinc, ATH+zinc, BABDP).

"Solar photovoltaic modules, inverters and systems: options and feasibility of EU Ecolabel and Green Public Procurement criteria", preliminary report, European Commission (JRC), 2021
https://publications.jrc.ec.europa.eu/repository/handle/JRC122430

Buildings 'Renovation Wave' consultation

An EU public consultation on revision of the Energy Performance of Buildings Directive is open to 22nd June 2021. The general public consultation poses questions on energy requirements for buildings, covering residential and other buildings, for new buildings and existing buildings and for building renovation, including the "whole life-cycle" performance. Questions also address obligations for installation of EV charging points. Opinions are also asked on funding policies and tools. Fire safety in renovation is not addressed in this consultation: however, it is possible for respondents to add this under 'further comments' (Q32).

European Commission general public consultation " Energy efficiency – Revision of the Energy Performance of Buildings Directive" ***open to 22nd June 2021*** *https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12910-Revision-of-the-Energy-Performance-of-Buildings-Directive-2010-31-EU/public-consultation*

INNOVATION

PIN FR polyamides for electronics

Thermoplastics specialist STS Tecnopolimeri uses DOMO PIN FR polyamides for performance household and electrical parts. The versatile non-halogen, melamine-based PIN FR polyamide PA6 and PA66 products offer mechanical and electrical properties enabling metal replacement and use in applications such as electronics casings, keyboards, displays, command boxes developed for the internet of things (IoT).

The PIN FR polyamide compounds support formulation adaptation for flowability, low migration and specific strength, surface and moulding demands. For example, DOMO has developed a specific PIN FR grade for connectors with UL Yellow Card, used in a washing machine, replacing a halogen FR material and meeting Glow Wire requirements, heat-aging stability and offering lower density.

"DOMO and Tecnoplimeri develop cutting-edge household and electronics parts", 9 March 2021 https://www.domochemicals.com/en/news-press/domo-teams-italys-sts-tecnopolimeri-develop-cutting-edge-household-and-electronics-parts

SABIC PIN FR solutions for EV batteries

PIN FR compounds offer new lightweight, high performance solutions for EV battery structural elements. SABIC offers an extensive performance materials range to replace metals and optimise electric vehicle batteries and supply equipment (EVSE) with reduced weight and flexible design possibilities, whilst ensuring crash and impact resistance, non-halogenated fire safety and enabling potential cost-effectiveness and high productivity. PIN FR glass-fibre reinforced polypropylene compounds achieve UL94 V-0 @ 1.5 mm and optimise large part manufacture, such as battery covers. PIN FR glass-fibre reinforced polyphenylene ether (PPE) / polyamide (PA) alloy can achieve UL94 5VA flame rating with high dimensional stability and structural stiffness for battery enclosures and frames.

"Reimagining EV battery and EVSE design with advanced thermoplastics", SABIC, 5/3/2021 https://www.sabic.com/assets/en/Images/SABIC-EV-and-EVSE-material-solutions_tcm1010-26488.pdf

"Plastic-intensive EV battery pack design", SABIC, 2020 https://www.sabic.com/assets/en/Images/SABIC-AUTO-ESS-002-EN-082820-WEB_tcm1010-24177.pdf

Low-smoke, halogen-free polyolefin cable

Benvic, a world leader in PVC compounds, has launched HFFR polyolefin cables for construction and electrical industries. The new LINKFLEX HF compounds for cables and sheathing ensure compliance with the EU Construction Product Regulations (CPR) EN 50575 Eca up to B2ca, with low droplets, using PIN flame retardants in a polyolefin matrix to ensure low smoke properties, IEC 60754-2 low acidity emissions. Material properties include chemical and weathering resistance, high flexibility to facilitate product installation, and optimised material processing characteristics.

"BENVIC for cables – halogen free compound solutions" http://www.benvicforcables.com/ and "BENVIC provides halogen freedom for the building and electrical industries", 20 November 2020 https://www.britishplastics.co.uk/News/benvic-provides-halogen-freedom-for-the-building-and-electri/

WAPOL: PIN FRs from waste materials

EU project develops PIN FR compounds using waste incineration ash and nitrogen FRs for PP, PA (polypropylene, polyamide).

The Horizon 2020 (EIT Raw Materials) project, WAPOL, is developing flame retarded polymers for the automotive industries using PIN FRs from waste materials.

PP filled with 20-30% municipal waste incineration ash (treated bottom ash) achieved UL94HB @ 1.6 mm with mechanical properties similar to those of PP-T20.

Polyamide 6 with 10 – 30% FRs (both unfilled and 25% glass fibre grades) achieved UL94-V0 @ 0.8 mm. For example, WAPOL PA6-GF25-V0 shows density of 1.38 g/cm^3, GWFI 960/2 and GWIT 875/2. Preliminary results on mechanical properties of PA6-GF25-V0 show tensile strength at break around 120 MPa, tensile modulus 9000-9500 MPa, Izod impact strength (ASTM, notched) around 70 J/m. Further optimisation is ongoing.

Results to date, presented at the IAFSS Symposium 2021, show that the WAPOL compounds can, in most cases, achieve specified fire performance at lower cost and lower greenhouse emissions than reference brominated/antimony FR compounds. Further work is underway to assess the impact of WAPOL material loadings on polymer mechanical and electrical characteristics.

""Environmental and cost studies of flame retardants derived from ashes for use in polymers", F. Amon, S. Dahlbom, P. Blomqvist, RISE, poster at IAFSS Symposium https://uwaterloo.ca/international-symposium-on-fire-safety-science/

"WAPOL: Waste materials for Antimony substitution in flame retarded POLymers", project website https://projects.dii.unipd.it/wapol/project/

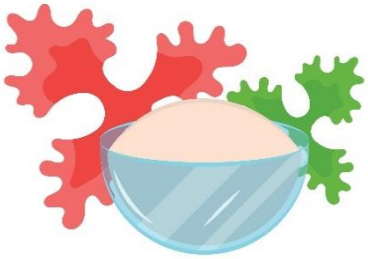
Performance PC/ABS and PC/ASA

Polymer Compounders Ltd (PCL) new polycarbonate blend compounds show excellent properties and low toxicity. Established in 1993, PCL specialises in engineering thermoplastics. Their new PC/ABS* and PC/ASA* blends claim better melt processing, lower density and physical properties as good as halogen FR compounds, but use reactive non-halogenated FR polymer formulations to ensure a favourable toxicity profile, no antimony, no FR migration and no bioaccumulation. UL94-V0 is achieved for 0.75mm and glow wire (GWIT) 960°C. PLC says the non-halogenated FR solution will enable to keep ahead of expected EU ECHA / Reach restrictions. The PC-ABS solution offers impact performance of 46 kJ/m^2 and is particularly adapted for applications such as electric vehicle battery casings which require both toughness and fire resistance.

** PC = polycarbonate, ABS = acrylonitrile butadiene styrene, ASA = acrylonitrile styrene acrylate*

"Introducing Flame Retardants PC-ABSCOM™ B6000 and PC-ASACOM™ S6000", 19 May 2020 https://polymer-compounders.com/en/worlds-first-halogen-free-fr-pc-abs-and-fr-pc-asa-materials-that-do-not-compromise-on-material-properties/

RESEARCH

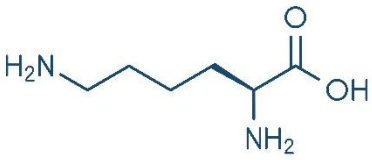


Metal alginates as PIN flame retardants

Alginates loaded with metal ions can provide effective bio-based PIN FRs for textiles, polymers, surface coatings …. Tens of thousands of tonnes of alginates are produced worldwide annually from brown algae, providing relatively low-cost bio-based materials which are not competing with food crops. Alginates are polysaccharides which are non-toxic and are flame retardant with incorporation of metal ions: sodium, calcium, zinc, copper, nickel, manganese, aluminium … Metal alginates can be bonded to fibres and rendered wash-resistant by cross linking, or alginate fibres can be woven into textiles to provide flame retardancy by char formation, as well as reducing toxic smoke emission and preventing flaming drip. Alginates can also be combined with phosphorus (e.g. DOPO), APP, clays, graphite, silanes, as possible FRs for different polymers. They have also been tested as lithium ion battery separators. This review concludes that more research is needed into the FR catalysis effects of different metals in alginates, into improving mechanical performance of alginates (which tend to be brittle) and into cost-effectiveness of application.

"An overview of alginates as flame-retardant materials: Pyrolysis behaviors, flame retardancy, and applications", Y-J? Xu et al., Carbohydrate Polymers 260 (2021) 117827 https://doi.org/10.1016/j.carbpol.2021.117827

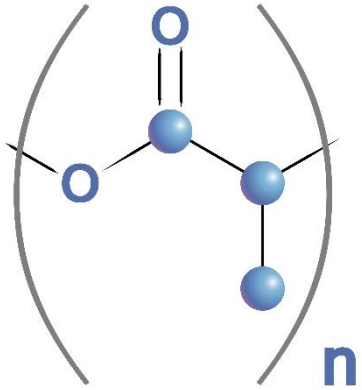
Bio-based PIN FR for cotton



The natural molecule polylysine, reacted with phosphoric acid, provides a durable PIN FR for cotton fabrics. The polypeptide ε-polylysine can be produced by natural fermentation or by a condensation reaction of the biological amino acid lysine, and is used as a food additive. Its large number of free amino groups enables binding of over 10% w/w phosphorus after reaction with glycerol and phosphoric acid. It contains nitrogen which may also contribute FR effect. Cotton fabric (124 g/m^2) was activated using sodium hydroxide, then soaked in the phosphorylated polylysine (10 minutes @ 95°C) then cured @ 185°C, achieving 20% load to cotton w/w. This treatment reduced after-flame and after-glow times to zero and reduced pHRR to 7% of untreated cotton. After 50 standard wash cycles, after-flame and after-glow were still zero, and pHRR was still only 14% of untreated cotton. Whiteness and mechanical properties of the cotton were well retained after treatment. The authors suggest that the small loss of fire performance with washing is due to replacement of ammonia groups in the polylysine by metals from the wash liquor.

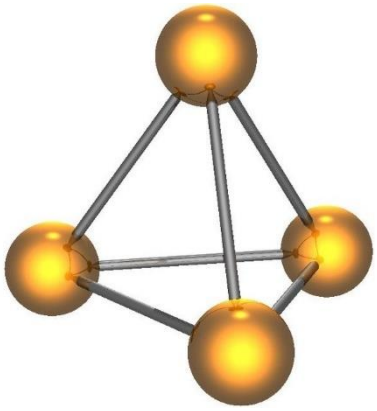
"A novel e-polylysine-derived durable phosphorus-nitrogen based flame retardant for cotton fabrics", F. Xu et al., Cellulose 2021
https://doi.org/10.1007/s10570-021-03714-z

"Green" synthesis of PIN FR for bioplastic



Researchers propose solvent-free synthesis of polymeric phosphorus FR for poly(lactic acid) bioplastic (PLA). The bio-based and biodegradable polymer poly(lactic acid) is highly flammable. Phosphoramides have shown to be effective PIN FRs for PLA at low loadings, but their synthesis relies on organic solvents. In this study, one-step synthesis of polyphosphoramide (DM-H) is demonstrated, without solvent or catalyst, from commercially available dimethyl methylphosphonate (DMMP) and 1,6-hexanediamine (HDA). A 2% loading of DM-H in PLA increased LOI to 30% (from 20% for neat PLA) but flaming dripping was not prevented and another additive would be needed to address this. The DM-H is considered to act by releasing phosphorus radicals which inhibit flame, releasing ammonia which quenches flame and by releasing phosphorus compounds which catalyse carbonisation of the polymer (char formation).

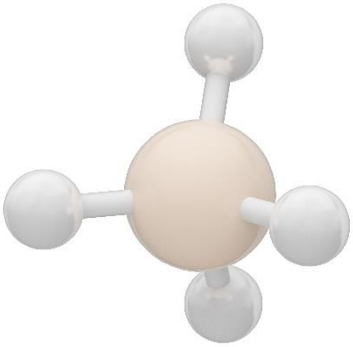
"One-Pot, Solvent- and Catalyst-Free Synthesis of Polyphosphoramide as an Eco-Benign and Effective Flame Retardant for Poly(lactic acid)", J. Feng et al., ACS Sustainable Chem. Eng. 2020, 8, 16612−16623,
https://dx.doi.org/10.1021/acssuschemeng.0c05931



Double FR functionality of phosphorus

An experimental P-based PIN FR for rigid polyurethane foam shows both gas phase and solid phase fire inhibition effects. Researchers synthesised (in two steps) a bi-functional, reactive phosphorus flame retardant for rigid polyurethane foam: PDEP, containing a DOPO and a phosphate (DEP, derived from diethyl phosphite). With12% PDEP and 8% expanded graphite, LOI was increased to 27% (from 18.5% neat foam) and UL94-V0 vertical burn test (10 mm thickness sample) was achieved. Analysis showed that the FR effect resulted from successive decomposition of DEP and then DOPO with increasing temperature. High levels of PO and PO_2 radicals released to the gas phase exert flame inhibition effect. In the solid phase, viscous P-based char bonded and integrated other chars, in particular from graphite, to generate an effective fire barrier.

"A phosphorous-based bi-functional flame retardant for rigid polyurethane foam", J. Wang et al., Polymer Degradation and Stability 186 (2021) 109516 https://doi.org/10.1016/j.polymdegradstab.2021.109516



N-P-Si FR for epoxy

Experimental reactive PIN FR improves mechanical and fire performance of epoxy resin. DOPO (phosphorus) and triethylamine (nitrogen) were reacted with silane (silicon) to generate an N-P-phenylsiloxane macromolecule (PD-PPD) which could be reacted into DGEBA epoxy resin. PD-PPD was tested at 0 – 9 % w/w in epoxy (i.e. up to 0.3% phosphorus). Impact strength, flexural strength and flexural modulus were increased 100%, 13% and 39% with the 9% DP-PPD loading, and peak heat release rate was reduced by 31% and smoke release by 20%. At 3 mm, the neat resin failed UL-94 whereas IL94-V0 was achieved with 3% or more DP-PPD. The authors consider that the flexible phenylsiloxane units reacting into the epoxy resin improve mechanical properties and that the fire performance is improved by a combination of catalysis of charring, reduction of volatile organic compounds emissions in fire and flame inhibition by phosphorus.

"High strength, low flammability, and smoke suppression for epoxy thermoset enabled by a low-loading phosphorus-nitrogen-silicon compound", W. Rao et al., Composites Part B 211 (2021) 108640 https://doi.org/10.1016/j.compositesb.2021.108640

OTHER NEWS

UK consults on POP ban for Dechlorane Plus. The UK Government has opened **to 18th June 2021** a public consultation on adding the halogenated flame retardant Dechlorane Plus to the Stockholm Convention list of Persistent Organic Pollutants. Documents presented note that the chlorinated FR is identified in Europe by ECHA as Very Persistent and Very Bioaccumulative and shows various chronic toxicity effects. The UK indicates that it will also propose to ban Medium Chain Chlorinated Paraffins under the Stockholm Convention.

"DEFRA considers designating three new persistent organic pollutants", 26th April 2021 *https://www.endsreport.com/article/1713979/defra-considers-designating-three-new-persistent-organic-pollutants*

PUBLISHER INFORMATION

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For abbreviations see: www.pinfa.org