Sweden proposes VAT penalties for certain flame retardants

Sweden has opened a public consultation (deadline 29th May 2015) on proposals for a tax on consumer electronic goods which contain certain chemicals. The published proposal is c. 13 €/kg for printed circuit boards and plastic parts, with a ceiling of c. 34 € per electronic appliance. 50% / 75% tax reductions are proposed to apply to products which contain no halogenated compounds (additive / reactive) and no “additive phosphorus compounds”. pinfa has submitted evidence that this targeting of “additive phosphorus compounds” will be counter-productive, as it will impact effective, safer PIN flame retardants, necessary to achieve fire safety in many polymers. pinfa also emphasises that this wording will also impact simple inorganic phosphorus compounds with no health or environmental impact concern, as well as natural phosphorus-based or bio-based flame retardants.


Consultation: fi.registrator@regeringskansliet.se Regeringskansliet, Finansdepartementet, Skatte-och tullavdelningen, Att: Johan Westlund, Jakobsgatan 24, 103 33 Stockholm, Sweden.
Showing how flame retardants save lives

pinfa has a new graphic illustration of “How flame retardants can increase escape time in fires”, see below. The graphs were prepared for pinfa by member company Clariant. They will be used on the new and improved pinfa website currently being prepared, which will be launched this month and are available for use in pinfa presentations and publications (Powerpoint and PDF versions) on request from the pinfa secretariat pinfa@cefic.be

How Flame Retardants can increase escape time in fires

Flame retardants reduce the risk of ignition and fire spread of many plastic and textile materials which results in more available escape time for occupants.

Time to flashover can increase from 5 minutes to 15 minutes which can make the difference between escape and fatalities.

Bear in mind that the escape time includes the time to discover the fire, alert other people, take the decision to call the fire brigade, take own actions to extinguish or take the decision to evacuate the building.

The times and temperatures in the graphs are typical numbers, but can vary according to the circumstances and materials involved.

THE 3 PHASES OF FIRE AND THE PROTECTING FEATURES OF FLAME RETARDANTS

- **Ignition source**
  - Prevent ignition
  - Possibly self-extinguish

- **Flame spread**
  - Slow down flame spread
  - Reduce heat release
  - Delay flash-over

- **Fire penetration**
  - Prevent the collapse of structures, e.g. steel columns protected by intumescent coatings
  - Prevent fire moving to adjacent room or building compartment
PIN FR composites for performance reinforced polycarbonates

Lanxess (a pinfa member company) has launched a new set of PIN flame retardant, continuous-fibre-reinforced thermoplastic composites with polycarbonate matrix. The halogen-free materials offer exceptional flame retardance, achieving UL94 V0 for 0.4 – 2 mm thickness sheets. Composites are available with glass, carbon and glass/carbon fibre reinforcement and fibre volume content of 45-55 %. They offer high mechanical performance, for example flexural modulus of 40 – 54 GPa (carbon fibre) or 20-24 GPa (glass fibre) and are adapted for production of large items requiring thin-wall and stiff housing parts, such as notebooks, tablets and TV sets.


ADK STAB FP-2000 series performance PIN FR

A pinfa member company ADEKA Corporation in Japan (Amfine Chemical Corporation: ADEKA’s subsidiary in the U.S) has launched ADK STAB FP-2000 series, a performance range of phosphorus-nitrogen based (PIN) flame retardants for polyolefins, polypropylene, high and low density polyethylene, ethylene vinyl acetate, etc. The products provide higher flame retardancy by formation of intumescent barriers on the polymer surface, inhibiting combustion, reducing carbon monoxide and smoke emission. They offer low density and high mechanical performance and can be used in outdoor applications without addition of special type of light stabilisers. UL94 5VA can be achieved with suitable synergists. Applications include wiring and cables, construction, transportation, electrical and electronics etc.


Ferric phosphate provides smoke suppression in epoxy

Ferric phosphate (FePO₄) at 0.5 – 3 wt% was tested as a synergist in PIN flame retarded epoxy resin (EP-44, MTHPA curing agent), in a 3 mm sheet. The PIN FR ammonium polyphosphate (APP) was used at 27-30 wt%. Addition of ferric phosphate somewhat reduced peak heat release rate, mass loss, total heat release, but in particular very greatly reduced smoke release rate, total smoke release and smoke factor. The ferric phosphate showed to considerably improve the char structure. The authors suggest that it acts by catalysing de-amination of APP. They conclude that ferric phosphate provides excellent smoke suppression in epoxy, offering important application opportunities.

Jet-set PIN fire safety

EMPA Switzerland has developed an innovative new PIN (Phosphorus, Inorganic, Nitrogen) fire safety treatment for wood furniture in business jets. The one-layer solution is based on a proprietary, high molecular weight, halogen-free flame retardant and is presented by EMPA as environmentally friendly and, because it does not evaporate, non toxic and odour free. Application and drying are rapid, minimising down-time for jets undergoing interior renovation, and enables stringent aircraft fire safety standards to be achieved wooden surfaces. Project leader Sabyasachi Gaan at EMPA would like to explore the use of this FR technology for household furniture and fittings in public buildings where fire safety standards are applicable, as well as in manufacturing of passenger aircraft. However, further research is needed to prove suitability of the new FR technology for such applications.

MPA project, Sabyasachi Gaan, see also pinfa Newsletters 37 and 43. “Environmentally friendly coating for aircraft furniture, Flame protection for the jet set », 9 January 2015 http://www.empa.ch/plugin/template/empa/3/154400

Growing non-halogenated flame retardant market expected

“HexaResearch” market report 2012-2020 predicts ongoing growth in non-halogenated flame retardants, driven by strict regulations to protect the environment and consumer banning halogenated products, combined with growing demand for engineering plastics particularly in automobiles and electronics. Public transport applications prefer non-halogenated flame retardant solutions because of low smoke density and low toxicity. The report expects non-halogenated flame retardants to become the dominant solution for respecting customer requirements and quality in engineering plastics.

“Transparency Market Report” projects a 8%/year growth for non-halogenated flame retardants through to 2018, driven by strict implementation of environmental regulations, fire safety requirements, and consumption of polymers in industries such as textiles, construction, electronics and transportation. Strict implementation of rules limiting production and import of goods containing halogenated flame retardants in North America and Europe will result in growth in non-halogenated flame retardant consumption in India, China, Indonesia and Malaysia which export towards these markets.


California safer chemicals work plan

California’s DTSC (California Department of Toxic Substances Control) has released a three-year work plan for safer consumer products regulation, part of California’s “Green Chemistry Initiative”. The plan covers Beauty/Personal Care and Hygiene, Building Products: Paints, Adhesives, Sealants and Flooring, Household/Office Furniture and Furnishings with perfluorochemicals or flame retardants, Cleaning Products, Clothing, Fishing and Angling Equipment, Office Machinery Consumable Products. Candidate chemical groups include brominated flame retardants (specifying as hazard traits: bioaccumulation, environmental persistence, undefined toxicity), some chlorinated FRs, and a few other flame retardant chemicals (see below). The objective, in particular for indoor furniture and furnishings, is to ensure that “older classes of chemicals e.g. brominated flame retardants” are not replaced by substitutes for which inadequate data is not yet available or which might pose toxicity concerns. To verify this, the work plan will look at organophosphorus flame retardants in building products and in furniture and furnishings.

Non-halogenated chemicals used as flame retardants listed by DTSC: t-Butylphenyl diphenyl phosphate, Tricresyl phosphate, Trimethyl phosphate, Triphenyl phosphate, Trixylyl phosphate, 2-Ethylhexyl diphenyl phosphate, Dimethylphosphate, Isodecyl diphenyl phosphate, Isopropylated triphenyl phosphate, Resorcinol bis(diphenyl phosphate)

California Department of Toxic Substances Control (DTSC) , Safer Consumer Products (SCP) final 2015-2017 work plan
http://www.dtsc.ca.gov/SCP/PPWP.cfm

FR Natural Rubber approved for London Underground

A new flame retardant, natural rubber developed by TARRC has been approved for use, after six months’ successful testing by London Underground. The zero halogen, low smoke, low toxicity “Natural-FR” rubber compound, developed by TARRC (Tun Abdul Razak Research Centre, the Malaysian Rubber Board’s UK Research and Promotion Centre) is used by Entrance Matting Systems (EMS) Ltd, UK and offers sustainability advantages including no halogens and further a life cycle analysis of the polymer has indicated a negative carbon footprint. The flooring application had to meet flammability requirements covering smoke density, smoke toxicity, heat release rate, flame spread, and dry and wet slip resistance. TARRC achieved this by modifying the natural rubber and using a flame retardant additive package. TARRC is also developing the product for technical applications such as railway vibration buffers, using a high-performance dynamic internal rubber with a flame retardant modified outer layer to ensure fire safety.


“TARRC commercialises Natural-FR”
http://www.tarrc.co.uk/pages/NaturalFRLondonUnderground.htm

EMS Entrance Matting Systems “London Underground debris channel matting range” http://www.entrance-matting.com/content/london-underground
Natural magnesium minerals as PIN flame retardants

LKAB Minerals, an international minerals company, offers UltraCarb, a PIN flame retardant produced from natural magnesium minerals (hydromagnesite, a hydrated magnesium carbonate, and huntite, a magnesium calcium carbonate). The product range has recently been extended to include new, ultrafine and/or surface treated grades which optimise processing and performance. LKAB Minerals’ PIN flame retardant products are used in a range of polymers, to contribute to fire safety, specifically for low smoke and char stabilization in a number of applications including cables, construction products, electrical and electronic equipment.

LKAB Minerals “Halogen-free FR filler for cables presented to US market”

Low-cost, high-performance HFFR cable polymers

Teknor Apex, a leading US material science company, has launched two new series of Halguard® halogen-free, flame retardant compounds for jacketing of cables in public transport, construction, electrical and electronics applications. The Halguard 58600 Series HFFR offers performance at an economical cost. This series offers UL 94 V0 vertical flame rating (down to 1/16” or 1.6 mm) and can achieve UL 1685 FT4 or UL 1666 fire safety standards depending on overall cable design. Technical performance characteristics include excellent tensile strength, flexibility and operation at up to 105°C. The Halguard 58300 series HFFR offers exceptional flame retardance for critical applications such as data centres and electrical substations. This series offers LOI values of 53-56%, achievement of UL1685 FT4 vertical tray test and UL94 V-0 (down to 1/32” or 0.8 mm).

Teknor Apex cable compounds: see also pinfa Newsletters 37 and 39

NSF/ANSI 426 Environmental Leadership standard for servers

NSF International (previously National Sanitation Foundation) has published draft “Environmental leadership” standards for computer servers and components. The proposed standards specify a reduction of bromine and chlorine content in plastic parts > 25g: where such parts contain > 1 000 ppm bromine or chlorine (3 000 ppm for postconsumer recycled plastics), then an alternatives assessment must be carried out and justified. This is based on the chlorine and bromine thresholds specified in IEC 62474 Material declaration for products of and for the electrotechnical industry and would largely exclude the use of halogenated flame retardants in significant plastics parts, so inciting towards use of PIN fire safety solutions. NSF will vote on the proposal by ballot deadline 19th May 2015.

Denmark EPA suggests health risks from chlorinated FRs

An study by the Danish EPA (Danish Ministry of the Environment, Environmental Protection Agency) assesses the safety of chemicals present in children’s car seats, strollers, mattresses and similar products (0-3 years age). Based on a literature screening, a number of chemicals considered to pose potential issues were measured in 59 samples from 30 items of baby equipment (chlorinated and brominated flame retardants, formaldehyde, phthalates, azo dyes). Migration tests were also carried out and then possible health and environmental risks assessed. Several chemicals were found at levels not conform to EU regulations (REACH). Three chlorinated FRs were the only chemicals for which the study indicates possible health risks (TDCP in child car seats and mattresses if used without covering sheets, TCEP and TCPP in baby slings). Non-halogenated PIN flame retardants would offer safer alternatives to ensure fire safety. None of the chemicals assessed were considered to pose environmental risks at the levels measured.

TDCP = Tris (1,3-dichloro-2- propyl) phosphate. TCPP = Tris (1-chloro-2-propyl) phosphate. TCEP = Tris (2-chloroethyl) phosphate (TCEP).


Banana tree sap flame retardant for textiles

Banana pseudostem sap (BPS), a regionally widely available by-product/waste of fruit production, was tested as an “eco-friendly” flame retardant for cotton textile (bleached woven cotton fibre). The cotton was pre-treated with tannic acid and alum, then impregnated in BPS by 30 mins. immersion under alkali condition, dosing soda ash (sodium carbonate) then drying at 110°C. Flame retardancy was significant, e.g. 1.6x increased LOI (limiting oxygen index), vertical self-extinguishing, horizontal afterglow spread 10x reduced compared to untreated textile. Wash durability of the BPS treatment was not good, but fibre mechanical strength was not deteriorated. The authors suggest that the flame retardancy effect of BPS may be due to the inorganic potassium, magnesium and phosphate salts in naturally contains.


Synergy of PIN flame retardants in EVA

The combination of two nitrogen-inorganic PIN FRs (ATH aluminium trihydroxide and MB melamine borate) was tested in EVA (ethylene vinyl acetate). ATH was tested at 50 – 60 wt% and MB at 10 wt%. The PIN flame retardant EVA achieved UL94-V0. The combination of ATH and MB offered improved fire performance (loss cone calorimetry, limiting oxygen index) and decreased smoke opacity. The authors conclude that the combined PIN FR system improves the protective char formed on the polymer surface in case of fire and increases thermal conductivity (so delaying ignition), in addition to the fuel dilution and water-release cooling fire inhibition properties of ATH alone. Furthermore, the emission of the toxic smoke gas hydrogen cyanide in fire scenarios was reduced.

"The combination of aluminum trihydroxide (ATH) and melamine borate (MB) as fire retardant additives for elastomeric ethylene vinyl acetate (EVA)", C. Hoffendahl et al., Polymer Degradation and Stability 2015 http://www.sciencedirect.com/science/article/pii/S0141391015000658
Other News

**Very low levels of phosphorus ester FRs** were found in air over the Northern China Sea. Total concentration of nine P-ester FRs analysed (TCEP, TCPPs, TDCPP, TiBP, TnBP, TEHP, TPP, TPPO, TCPs) was 47 – 161 pico grammes/m$^3$ in airborne particles. None of the FRs were detectable in the gas phase. Chlorinated P-esters made up 66 – 84% of the FR content.

**Environmental breakdown of flame retardants:** an assessment of photochemical and microbial degradation concludes that more data is needed on breakdown on recent brominated flame retardants (introduced in place of banned or curtailed substances), including regarding degradation of polymer brominated FRs, identification of breakdown products, radical formation and transformation indoors.

**New alternative brominated FRs** were tested for teratogenicity and reproductive toxicity using zebrafish. At 10 µM concentration, PBP-AE (ATE = allyl 2,4,6-tribromophenyl ether) showed no effects, TBP-DBPE (DPTE = 2,3-dibromopropyl 2,4,6-tribromophenyl ether), DBE-DCBH (TBECH = 1,2-dibromo-4-(1,2-dibromoethyl)cyclohexane) and TBP-BAE (BATE = 2-bromoallyl 2,4,6-tribromophenylether) inhibited hatching and/or induced abnormalities in offspring.

**TBOEP effects on Daphnia:** the ethyl phosphorus FR TBOEP (tris(2-butoxyethyl) phosphate) was tested for chronic toxicity on D. magna (21 days) at 15 – 1500 µg/l. There were no significant effects on growth, survival or reproduction (compared to zero dosage control). Analysis showed that transcription was modified for a number of genes related to e.g. protein or energy metabolism.


---

**Announcement:** the full speaker and poster programme of FRPM 2015 is now online


### Agenda

Events with active pinfa - pinfa-na participation are marked: ►

<table>
<thead>
<tr>
<th>Date</th>
<th>City</th>
<th>Event Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 June</td>
<td>Brussels</td>
<td>▶ pinfa General Assembly</td>
<td><a href="http://www.pinfa.eu">http://www.pinfa.eu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Announcement: the full programme (speakers &amp; posters) for FRPM is now online</td>
<td><a href="http://www.frpm2015.bam.de/en/programme/index.htm">http://www.frpm2015.bam.de/en/programme/index.htm</a></td>
</tr>
<tr>
<td>30 June – 2 July</td>
<td>Shanghai</td>
<td>10th Shanghai International Flame-retarding Material Technology Fair</td>
<td><a href="http://www.chinaexhibition.com/Official_Site/11-7030-CFRS_2015-">http://www.chinaexhibition.com/Official_Site/11-7030-CFRS_2015-</a></td>
</tr>
<tr>
<td>5-7 Oct</td>
<td>New Delhi</td>
<td>Fire India</td>
<td><a href="http://www.fire-india.com/">http://www.fire-india.com/</a></td>
</tr>
<tr>
<td>5-7 Oct</td>
<td>Tsukuba, Japan</td>
<td>10th Asia-Oceania Symposium on Fire Science and Technology (AOSFST)</td>
<td><a href="http://www.iafss.org/10th-aosfst/">http://www.iafss.org/10th-aosfst/</a></td>
</tr>
<tr>
<td>3 Nov</td>
<td>Brussels</td>
<td>▶ pinfa workshop Building the future for flame retardants in B&amp;C (building and construction)</td>
<td><a href="http://www.pinfa.eu">www.pinfa.eu</a></td>
</tr>
<tr>
<td>4 Nov</td>
<td>Brussels</td>
<td>pinfa General Assembly</td>
<td><a href="http://www.pinfa.eu">http://www.pinfa.eu</a></td>
</tr>
</tbody>
</table>

**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). 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. **Abbreviations:** See pinfa website: http://www.pinfa.eu/library/glossary-of-abbreviations.html

---

**Tuesday 3rd November 2015 – Brussels**

**pinfa stakeholder & industry workshop:**

Building the future for flame retardants in B&C (building and construction)

*Information: pinfa secretariat and www.pinfa.eu*

**Developments in fire safety and PIN flame retardant solutions**

- Regulators
- Insurers
- Architects and construction industry
- PIN flame retardant producers and users – compounders – construction and insulation products
- Scientists – experts - NGOs
- Fire standards – Construction Products (CPL / CPR) – harmonisation
- Smoke emissions, toxicity and corrosivity
- Green buildings and ecolabels – indoor air quality