pinfa

Newsletter for non-halogen fire safety solutions

August 2012 – N° 22



Innovation

Contents

California considers moving backwards on fire safety

In a move without precedent, California Governor Edmund Brown has proposed to effectively dismantle the State's furniture fire safety legislation, replacing the current TB117 requirement for small-flame resistance by a simple "smouldering cigarette" test, generally recognised as providing no real fire protection for the public, because it does not prevent furniture catching light from other heat sources (candles, electrical faults) nor prevent furniture foam providing fast-burning fuel to a fire starting in other items, resulting in considerable heat release and smoke and very little time for occupants to escape. This would be the first time that any authority has knowingly and deliberately regressed or removed fire safety requirements. The proposal comes in a context where environment and health organisations' concerns about certain chemicals are resulting in unjustified rejection of all flame retardants (see pinfa Newsletter n°21). However, rather than increasing fire risk for the general public, such possible concerns should be addressed by maintaining the fire safety requirement and either excluding the use of certain substances or requiring the use of other approaches.

Fire safety is achieved by a combination of complementary solutions, used together, including appropriate flame retardants. Many studies show that fire resistance requirements do prevent fires starting and so reduce deaths, injuries and material losses (see eg. pinfa Newsletter n°10 (1999 assessment of the effectiveness of the UK furniture fire safety regulations). pinfa fully supports critical reviews of fire safety standards and of environmental and toxicological properties of flame retardants, but believes that simply repealing fire safety standards will reduce public and consumer safety.

California State Assembly: http://aesm.assembly.ca.gov/californiaflamiblitystandards

Statistical report on the effectiveness of the UK Furniture and Furnishings (Fire) (Safety) Regulations, 1988, Greenstreet Berman, December 2009: http://www.bis.gov.uk/files/file54041.pdf

US federal questions on furniture fire safety

A US Senate Subcommittee hearing on flame retardants, chaired by Dick Durbin, heard that 7 000 reported home fires per year start in upholstered furniture, leading to 500 deaths, 890 injuries and US$ 442 million property damage. However, questions are asked about the safety to health and the environment of certain flame retardants used in furniture. The US Environmental Protection Agency announced that it will investigate the flame retardants targeted by such concerns. The head of the US Consumer Product Safety Commission considered that regulators should speed up the replacement of such flame retardants. The CPSC considers that the risks from fires resulting from contacts of upholstered furniture with flames can be reduced by fire-proof barriers, added to prevent the flames reaching the cushion foams. This is based on a CPSC report published May 2012 which shows the effectiveness of such fire-proof barriers in the conditions tested.

Senate hearing: http://durbin.senate.gov/public/index.cfm/pressreleases?ID=297ffe35-dc8b-47a3-9932-a831504dc023

US CPSC report, 9th May 2012 "Upholstered Furniture Full Scale Chair Tests – Open Flame Ignition Results and Analysis": http://www.cpsc.gov/library/foia/foia12/os/openflame.pdf

US-EPA DfE alternatives assessment for Deca-BDE

The US Environmental Protection Agency (EPA) has made available for public comment (until 30th September 2012) a draft Design for the Environment (DfE) report assessing 30 alternatives for the brominated flame retardant DecaBDE. This follows proposals made by EPA in April to include all PBDE brominated flame retardants under TSCA SNUR (Toxic Substances Control Act Significant New Use Rules) which would require reporting of all new uses in domestic manufacture or imported products (see pinfa Newsletter n°19). EPA indicates that the alternatives to DecaBDE considered in the draft report are already available, may have a lower potential for bioaccumulation in people and in the environment, and offer varying characteristics: some appear to offer low health risk but may be persistent, others are less toxic. The 30 alternatives assessed include halogenated substances, antimony trioxide and a range of PIN flame retardants including aluminium, magnesium, zinc, melamine (nitrogen) and phosphorus compounds.

US EPA press release 30th July 2012 http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/

EPA draft report for public comment: "An Alternatives Assessment for the Flame-Retardant Decabromodiphenyl Ether (DecaBDE)" (PDF, 812pp, 10.2MB) http://www.epa.gov/dfe/pubs/projects/decaBDE/deca_fullreport.pdf

Comments to Emma Lavoie (Lavoie.Emma@epa.gov) by 30th September 2012

Bus fire research

Bus and coach fires are considered a serious issue in China, following a number of tragic incidents with lives lost. The authors used the NIST Fire Dynamics Simulator model (FDS) to assess how smoke and fire develop in a bus, depending on the type of fire source, where the fire starts, and the combustible materials present. Temperature inside the bus was indicated as reaching 415°C with the bus completely full of smoke in less than one minute if doors remained closed, and 1000°C if front and rear passenger doors were opened. Another article emphasizes that bus fire protection is inadequate, and recommends a range of measures to improve safety, including controlling flammability of materials, limiting luggage and keeping exits clear, ensuring the structural integrity of the bus in case of fire. A recent research report in Finland indicates that the number of bus fires has doubled over the past decade, without being able to identify the reasons for this. Attention to fire safety aspects in vehicle maintenance is considered important, and fire resistance of interior materials "crucial for the prevention of catastrophic incidents".

"Numerical simulation study on bus fire", Zhang et al., State Key Laboratory of Fire Science, University of Hefei, China, 2011 http://dx.doi.org/10.1109/RSETE.2011.5964326

"Consideration after Persistent Self-Burning of Buses", H. Chow, Research Centre for Fire Engineering, Hong Kong Polytechnic University http://www.bse.polyu.edu.hk/researchCentre/Fire_Engineering/Hot_Issues/20120207-CFFTD1G.pdf

VTT Research Report "Bus fire safety in Finland": http://trid.trb.org/view.aspx?id=1097669

Puyang bus fire, June 2012: http://www.mdmpublishing.com/mdmmagazines/magazineapf/newsview/465/

Hunan bus fire, July 2011: http://www.chinabuzz.net/buzz/deadly-bus-fire-on-expressway-claims-41-lives/

Bus fire recalls and investigations

In Washington DC, 94 Daimler Orion buses have been withdrawn from service, following two fires in a week. In Montgomery County MA, Navistar ride-on buses have been taken out of service after seven caught fire in three years. Investigations said that the causes of the incidents were different, but a common feature was the speed with which fire spread through the bus interior. Australian official investigators have published conclusions concerning a fire in a 3-year old Mercedes New South Wales State Transit Authority bus which burnt out in July 2011. This fire started in the engine air compressor, possibly as a result of a rupture in a coolant pipe, then evaporation of water from the coolant leaving flammable ethylene glycol, this despite modifications having been made on this bus following 11 previous fires in this type of bus in Western Australia. The fire reached the passenger compartment by burning though a floor hatch and the interior of the bus completely burnt out despite fire service intervention.

Washington Daimler Orion bus recall: http://www.firerescue1.com/firefighter-safety/articles/1273450-2nd-DC-bus-fire-prompts-removal-of-94-buses/

Montgomery Navistar ride-on bus fires: http://www.gazette.net/article/20120719/NEWS/707199835/1124/ride-on-buses-show-history-of-sudden-fires

Fire investigation STA bus MO4878, July 2011: http://www.otsi.nsw.gov.au/bus/preliminary_report_bsi_fire_involving_sta_bus_mo4878.pdf

WEEE Directive updated

The European Directive on Waste Electrical and Electronic Equipment (WEEE), previously 2002/96/EC, has now been updated by 2012/19/EU. The updated Directive increases the mandatory recycling/reuse objectives for Member States to 65% by 2019, whereas at present only around one third of electrical waste is recycled or reused, most goes to landfill or inappropriate disposal. Stores will be required to take back for free for recycling consumers' small electronic goods, even if no new item is purchased. The Directive's scope is widened to cover nearly all E&E equipment, including items such as toys, lighting, computers, consumer electrical and electronic goods, photovoltaic panels, medical devices … As in the existing WEEE Directive, "plastics containing brominated flame retardants" must be removed from collected WEEE. The Restriction of Hazardous Substances (RoHS) Directive, previously 2002/95/EC, was already updated by 2011/65/EC in June 2011, and bans the use of PBDE and PBB brominated flame retardants in electrical and electronic equipment in Europe and indicates that "the risks to human health and the environment arising from the use of Hexabromocyclododecane (HBCDD) … should be considered as a priority" (see pinfa Newsletter n°13).

RoHS II Directive 2011/65/EC: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:174:0088:0110:EN:PDF

WEEE II Directive 2012/19/EU : http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:197:0038:0071:EN:PDF

Phosphorus and mineral synergy for aircraft interiors

The phosphorus-based flame retardant DOPO was tested in combination with the microfibre aluminium oxide hydroxide mineral Boehmite for an epoxy novolac resin material for aircraft interiors. Flammability (UL 94 test), thermal stability (glass transition temperature) and mechanical properties (DMA modulus, fracture toughness) were tested. Epoxy novolac resins show minimal shrinkage during curing, thus optimising adhesive properties, and halogen-free solutions are necessary for aircraft applications because of requirements concerning smoke toxicity. Results showed that tested mechanical properties were not affected by the inclusion of DOPO at dosages of up to 1% phosphorus by weight, and that the mineral Boehmite both improves fire performance (synergy with DOPO) and significantly improves the fracture toughness.

DOPO: 9,10- Dihydro-9-oxa-10-phosphaphenanthrene-10-oxide

"Fire behaviour and mechanical properties of an epoxy hot-melt resin for aircraft interiors", T. Neumeyer et al, ECCM15 – 15th European Conference on Composite Materials, 24-28 June 2012, Proceedings ISBN 978-88-88785-33-2 http://www.eccm15.org/page.php?id=95

Other relevant recent publications:

"Novel DOPO-based flame retardants in high-performance carbon fibre epoxy composites for aviation", B. Perret et al., European Polymer Journal, Vol. 47, Issue 5, May 2011, pages 1081–1089 http://dx.doi.org/10.1016/j.eurpolymj.2011.02.008

"A effective flame retardant for epoxy resins based on poly(DOPO substituted dihydroxyl phenyl pentaerythritol diphosphonate", Wang et al., Materials Chemistry and Physics, Vol. 125, Issue 3, Feb. 2011, pages 536–541 (Elsevier) http://dx.doi.org/10.1016/j.matchemphys.2010.10.020

"Pyrolysis and fire behaviour of epoxy resin composites based on a phosphorus-containing polyhedral oligomeric silsesquioxane (DOPOPOSS)", W. Zhang et al., Polymer Degradation and Stability, vol. 96, Issue 10, Oct. 2011, pages 1821–1832 (Elsevier) http://dx.doi.org/10.1016/j.polymdegradstab.2011.07.014

Phosphorus FR synergy for polymers and wiring boards

A US patent application presents combinations of two phosphorus FRs (DOPO derivatives and phosphinic acid mineral salts, e.g. aluminium) for flame retardancy of different polymers, including polyesters, polyamides, polycarbonates and PBT (polybutylene terephthalate). The FR combinations reduce dripping flames during burning, improve electrical properties (CTI) and are resistant to leaching by water. UL94 testing in glass fibre reinforced PBT showed flame retardancy (UL94 V0 with 17-20% total of the two FRs), self-extinguishing and absence of burning drips. Another patent presents combinations of DOPO and phosphinic acid salts for flame retardancy of epoxy resins, in particular for epoxy prepregs, laminates, and printed circuit boards, offering mechanical and thermal performance for the laminates.

US patent application US 2012 0095140, April 2012, "DOPO flame retardant compositions": *http://www.google.com/patents/US20120095140*

US patent application US 2011 20110294920, December 2011, "DOPO flame retardant in epoxy resins" *http://www.patentstorm.us/applications/20110294920/description.html*

Hong Kong Consumer Council finds mattresses not safe

7 out of 25 mattresses tested by the Hong Kong Consumer Council were found to not be fire resistant, despite passing the "smouldering cigarette" test obligatory for mattresses sold there. The Consumer Council chief executive said that legislation should be tightened to require more stringent fire resistance testing.

Media coverage: http://www.thestandard.com.hk/breaking_news_detail.asp?id=21627

Ammonium polyphosphate and bamboo fibres

Silica gel microencapsulated ammonium phosphate (APP) demonstrated flame retardancy synergy with bamboo fibres in low density polyethylene (LDPE), polypropylene and Poly(butylene succinate) PBS, a polymer which offers the advantage of excellent biodegradability. The bamboo fibre provides a hydroxyl-containing carbon source for the intumescent action of the flame retardant. In LDPE, the bamboo fibre provides mechanical properties (strength, toughness), as well as ease of separation for recycling and biodegradability. Fire resistance was tested using UL94 and LOI (limiting oxygen index), showing that UL94 V0 could be achieved with appropriate APP – bamboo fibre combinations, optimal 1:1 ratio by weight APP: fibres. In PBS and polypropylene polymers, the microencapsulated APP/bamboo fibre combination also enabled UL94 V0 to be achieved. SEM analysis illustrates the char surfaces generated, which protect the polymer from fire.

"Investigation on Flame Retardant and Thermal Properties of Novel Intumescent Flame Retardant Low-Density Polyethylene Composites", X. Liu et al., Advanced Materials Research Vol. 548, 2012, pages 64-67: *http://www.scientific.net/AMR.548.64*

"Investigation on Flame Retardancy and Thermal Degradation of Flame Retardant Poly(butylene succinate)/Bamboo Fiber Biocomposites", S. Nie, X. Liu et al., Journal of Applied Polymer Science, Vol. 125, E485–E489, 2012, (Wiley) *http://onlinelibrary.wiley.com/doi/10.1002/app.36915/full*

"Intumescent flame retardation of polypropylene/bamboo fiber semibiocomposites", J. Thermal Analysis and Calorimetry, 2012 (Springer) *http://www.springerlink.com/content/g81r86068172h974/*

For information: other recent publications concerning bamboo fibre composite flame retardancy: "Effect of nano nhydrous magnesium carbonateon fire-retardant performance of polylactic acid/bamboo fibers composites", Li et al., J Nanosci Nanotechnol. Vol. 11, n°12, pages 10620-3, Dec. 2011 *http://dx.doi.org/10.1166/jnn.2011.4103*

ENFIRO alternative flame retardant workshop

The European Commission funded project ENFIRO is working on the substitution of some specific brominated flame retardants". ENFIRO has selected 17 PIN flame retardants (FRs) as alternatives for three brominated FRs. The project aims to deliver a comprehensive dataset on viability of production and application, environmental safety, and a life cycle assessment of the alternative flame retardants. A workshop on flammability, applications, toxicity, exposure and Life Cycle Assessment will take place 7-8th November 2012, Brussels, and a première screening of the ENFIRO film "Burning Questions" on 7th November at 18h00.

ENFIRO (Life Cycle Assessment of Environment-Compatible Flame Retardants: Prototypical Case Study): www.enfiro.eu

Flammable materials and furniture are killing fire fighters

A presentation by Sean DeCrane, Cleveland Fire Department and IAFF, shows that fire fighter deaths in US building fires due to traumatic injuries have increased from 1.8 to nearly 3 deaths per 100,000 fires from the 1970's to the 1990's. Key contributing factors, he suggests, are that building contents burn hotter and faster, in particular thermoplastics and polyurethane foam in furniture. Increased fuel loads result from the mass of consumer items, clothes, upholstered furniture and textiles in homes. Mr DeCrane emphasises the importance of building codes and sprinklers in reducing risk and consequences of fires. This hypothesis supports the need for fire retarded thermoplastics and polyurethanes, to reduce fire spread and temperatures, as part of the overall fire safety toolbox.

S. DeCrane, M24 "Fire Fighter Safety Through Building Codes and Standards, NFPA Conference & Expo, 10-13 June 2012: http://www.nfpa.org/download.asp?type=2012cepapers&file=m24.pdf

Electronics environment performance standards

New IEEE 'Environmental Assessment Standards' for Imaging Equipment and Televisions will require labelled equipment to be free of halogenated flame retardants and PVC. These standards define environmental performance criteria, providing a tool for corporate and institutional Green Purchasing and for consumer choice, and identifying products "*demonstrating the leading environmental performance currently available in the marketplace*". These are presented as presenting a precedent for future IEEE EPEAT standards, that is the global registry for green electronics, covering some 45 manufacturers and at present over 3,000 registered products, and set as a purchasing requirement by many institutions.

IEEE (Institute of Electrical and Electronic Engineers) 1680 Standards: http://grouper.ieee.org/groups/1680/ (see 1608.2 Imaging Equipment and 1680.3 Televisions), approved by the IEEE SA Standards Board 30th August 2012.

Laptop and mattress fire kills 6

Investigations suggest that the tragic home fire in Rehovot, Israel, this spring was caused by a laptop left on a bed, overheating and igniting the bedclothes and mattress. The family father and five children died in the fire. The Israeli Fire Brigade Bureau reminds that laptops placed on soft surfaces (upholstered furniture, beds) are likely to have their cooling ventilation vents blocked, and so risk overheating. Laptops should only be placed on hard surfaces where adequate ventilation is ensured when in operation. Turned-on electrical devices and heat sources should be kept away from mattresses, which in most countries worldwide are highly flammable.

Media coverage Rehovot laptop and mattress fire: http://www.timesofisrael.com/overheated-laptop-sparked-rehovot-fire-that-killed-six/

Toyota door fire investigation

The fire risk of some 1.4 million Toyota vehicles is being investigated following 160 reported fire incidents and 9 injuries. Similar investigations target some 340 General Motors Chevrolet vehicles. According to the US National Highway Traffic Safety Administration (NHTSA) a driver's door window switch in certain Camry, Yari, Highlander, Solara and RAV4 2007 -2009 models can overheat and ignite

Feds probe 1.4 million Toyotas for window switch fires:
http://content.usatoday.com/communities/driveon/post/2012/06/camry-fire-power-window-switches/1

Abbreviations

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

Agenda

Events with active pinfa participation are marked: ►

********** 2012 **********		
9-12 Sept. 2012	Berlin, Germany	►Electronic Goes Green 2012+ www.egg2012.de
17-20 Sept. 2012	Chengdu, China	2nd International Symposium on Flame-Retardant Materials & Technologies (ISFRMT) http://www.isfrmt.org/
27-28 Sept. 2012	Chicago	►2nd International Conference on Fires in Vehicles (FIVE) www.firesinvehicles.com
17-20 Oct. 2012	Hefei, China	9th Asia-Oceania Symposium on Fire Science and Technology http://aosfst.csp.escience.cn/dct/page/1 and 2nd International Symposium on Flame-Retardant Materials & Technologies (ISFRMT 2012) www.isfrmt.org
7-8 Nov 2012	Brussels	ENFIRO Workshop on alternative flame retardants "Burning Questions" www.enfiro.eu
10-14 Nov 2012	Dammam, Saudi Arabia	4th SFPE-SAC – Fire Protection Conference http://www.sfpe-saudi.org/2012Conference/index.html
27-28 Nov 2012	Atlanta, Georgia, USA	Minerals in Compounding (AMI) http://www.amiplastics-na.com/Events/Event.aspx?code=C475
27-29 Nov 2012	Cologne, Germany	Fire Resistance in Plastics 2012 http://www2.amiplastics.com/Events/Event.aspx?code=473
********** 2013 **********		
28-30 Jan 2013	San Franciso, USA	Fire and Materials 2013 http://www.intersciencecomms.co.uk
16 Apr 2013	Indianopolis, USA	'Modern Vehicles: Techniques and Technology' workshop in FDIC (Fire Department Instructors Conference) http://www.fdic.com/attend/conference/workshops.html
13-14 Jun 2013	Denver, Colorado	Fire Retardants in Plastics (AMI) http://www.amiplastics-na.com/events/Event.aspx?code=C516
24-26 Jun 2013	Windsor, UK	Interflam 2013 www.intersciencecomms.co.u
25-28 Jun 2013	Lund, Sweden	6th European Combustion Meeting http://www.ecm2013.lth.se/
30 Jun – 4 July	Lille, France	14th FRPM (Flame Retardancy and Protection of Materials) http://www.frpm2013.eu