pinfa

Newsletter for non-halogen fire safety solutions

*July 2012 – N° 21*



Innovation

## Contents



## Industry sponsorship of fire safety campaigns questioned

The 'Chicago Tribune' journal has published a series of articles suggesting that fire safety campaigns have been funded by industry, and that flame retardants in furniture do not contribute to fire safety. pinfa welcomes an open debate on the fire safety contribution of flame retardants, and on their health and environmental safety, but regrets that on certain points the Chicago Tribune articles present very partial information. Levels of flame retardants used in consumer products will indeed not prevent products burning in a fully developed room fire - but that is not their aim. Flame retardants are used to prevent fires starting (inhibit ignition), and slow initial fire development, to give occupants time to escape, sprinklers time to act and fire fighters time to intervene. Many studies show that PIN flame retardants do this effectively when used appropriately. pinfa is in contact with fire safety organisations, because our industry's role is to further fire safety, but we have never been involved in funding these organisations to affect their independence. pinfa believes that PIN flame retardants save lives and properties from fire, without the environmental and health questions of the halogenated flame retardants targeted by the 'Chicago Tribune' articles.

*Tribune Watchdog "Playing with Fire":* http://media.apps.chicagotribune.com/flames/index.html

## PIN FR for LEDs and transparent polymers

A naturally-sourced Hallyosite clay–based flame retardant will be used by Samsung Cheil Industries, an affiliate business of Samsung Group, as part of a proprietary formulation for LED applications (Light Emitting Diodes). The Dragonite-XR:LBV™ additive is part of Applied Minerals' halogen-free range of flame retardants, offering V0 fire performance synergy with other PIN flame retardants such as magnesium and aluminium hydroxides or other clays, and is compatible with high temperature processing (water not released until 400°C). LED light sources are used in LCD TVs and displays, smart phones, tablets, store signs, public transport and many other applications. The Dragonite-XR:LBV flame retardant additive offers fire resistance, mechanical reinforcement and, importantly, high optical transparency.

*Applied Minerals news, 24th April 2012: http://appliedminerals.com/news/article/applied-minerals-inc.-enters-into-agreement-to-supply-samsung-cheil-in*
*Dragonite-XR: http://appliedminerals.com/applications/flame-retardancy-application-page*

## pinfa workshop on sustainable flame FRs for electronics, Tokyo, met by huge interest

Since 2009, pinfa has held workshops on sustainable flame retardants in electric and electronic applications. After two events in Brussels, Belgium, one was held in Taipei, Taiwan, last November and now in Tokyo, Japan. Alongside the Japanese Printed Circuits Association's (JPCA) trade show, this half day seminar covered regulatory and environmental developments on flame retardants as well as reports from original equipment manufacturers Panasonic and FujiXerox on their experiences with the transition to non halogenated flame retardants. iNEMI gave an update on their technical projects for low halogen materials in electronics.


Finally, pinfa member companies presented their latest solutions for making electronic material safe. We are considering a next pinfa workshop together with pinfa North America in the USA in 2013.

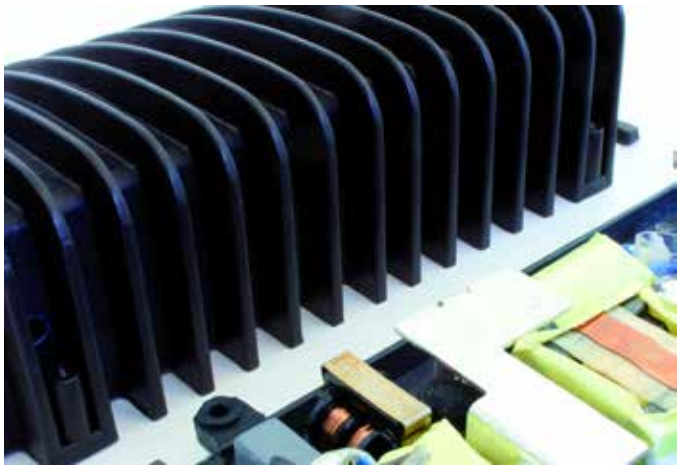
*Photo: the speakers of the pinfa "Electronics Flame Retardants" workshop in Tokyo, 14th June 2012.*

*The workshop agenda and presentations are available at www.pinfa.org*

## Marine cable specialist certification approvals

Helkama, Finland, is specialised in the development and manufacture of marine cables. The company has chosen to produce only halogen-free cables, which improve the safety of ships by reducing emissions of toxic fumes and smoke. The company offers reduced weight, high performance, easy installation cables, conform to flame-retardant IEC 60332-3A or fire-resistant IEC 60331 standards. These halogen-free cables are approved by all major classification societies. http://www.helkamabica.fi

## Thermally conductive PIN FR polyester



The high-tech thermoplastic developer LATI has launched a thermally conductive, halogen-free PA6 compound Laticonther 62 CEG/500-V0HF1 for electronics and electrical applications where heat dissipation is important, e.g. for transformers, mains adapters, electronics circuits. Cooling is increasingly important as E&E devices become both more miniaturised, so concentrating heat production, and more powerful, both in terms of data processing capacity (electronics) or electrical power (e.g. transportation). The material offers wide fire resistance (V0 at 1.5 mm, GWFI 960°C, and 775°C GWFI at 1 mm) and heat transmission much better than any ordinary plastic product, whilst maintaining the advantages of injection molding: cost, ease of use, design flexibility. The material has already been used by SAPLAST for electronics boxes where cooling is achieved directly through the Laticonther polymer casing which includes finning to increase heat exchange.

*Source: http://www.lati.com/en/news/2011/thermally_conductive_and_self-extinguishing_ul_94.html and http://www.lati.com/en/news/2012/ts45545.html*

## Bio-derived flame retardants and oxidants

Researchers are looking at deriving new flame retardant materials from agricultural waste products or other renewable biological materials. Cashew nutshell liquid (Cardanol), a food industry waste, was treated with different organic oxydants to produce polyphenols which showed low heat release and high char production, suggesting that they could prove effective as flame retardants for carpets and textiles. The research is being funded by the Massachusetts Toxic Use Reduction Initiative (TURI) in the EPA People, Planet and Prosperity programme (P3).

*"Halogen-free ultra-high flame retardant polymers through enzyme catalysis", S. Ravichandran et al., Green Chemistry, Issue 3, 2012: http://pubs.rsc.org/en/content/articlelanding/2012/gc/c2gc16192c*

*"A renewable waste material for the synthesis of a novel nonhalogenated flame retardant polymer", S. Ravichandran et al., J. Cleaner Production, vol. 19, issue 5, 2011 http://www.sciencedirect.com/science/article/pii/S0959652610003604*

## 13 killed in coach fire

An electrical short-circuit in a door is thought to have been the cause of a coach fire which killed 13 and injured 22 more in Hulu Air, Limapuluh Kota, West Sumatra on 1st May 2012. 48 people were on the coach, and were mainly asleep when the bus caught fire. Indonesia's Parliament is requesting a review of bus and coach roadworthiness tests. This incident again confirms the problem of fire safety in buses and coaches, resulting largely from inadequate fire performance requirements for materials used (interior fittings, seats, plastic structural elements …). Some 1 out of 100 buses and coaches on the road suffer a fire incident every year, according to SP Sweden.

*Media: http://www.thejakartapost.com/news/2012/05/01/short-circuit-likely-behind-deadly-bus-fire-west-sumatra.html*

*SP Fire Technology, Sweden, Brandposten magazine n°42 "Fires in vehicles": http://www.sp.se/en/units/fire/information/brandposten*

## Report suggests PIN FRs are reliable and cost effective

The New York State Task Force on Flame Retardant Safety, headed by the State's Department of Health, has concluded that three PIN flame retardants (Magnesium Hydroxide, RDP Resorcinol Bis(diphenyl phosphate) and Boric Acid) are reliable and cost-effective, and are viable alternatives to the brominated flame retardant Deca-PBDE. The report covers applications in upholstered furniture or electronics. A voluntary phase-out, announced by the US Environmental Protection Agency (EPA) in 2009, will end the importation, production, and sale of Deca-BDEin the USA by 31st December 2013. The Task Force states that "*Fires are a major cause of property damage, injuries and death in the United States and in New York State, and pose a risk to fire-fighter health and safety … Flame retardants are one mechanism to help reduce the risk and dangers associated with fires by increasing ignition resistance, or reducing flame spread, heat output and smoke production. Flame retardants in commercial materials and products are part of efforts to improve fire safety at both the state and national level*."

*"Draft Report of the New York State Task Force on Flame Retardant Safety Review", December 2011, open for public comment until 9th July 2012: http://www.health.ny.gov/environmental/investigations/flame/flame_retardant.htm*

## Recycled magnesium potential flame retardant

Magnesium, recovered from metallurgy works wastes as magnesium hydroxide, could be used as a flame retardant. A process tested by the China ENFI Engineering Corporation enables recovery of magnesium sulphate, magnesium hydroxide $Mg(OH)_2$ and magnesium ammonium phosphate (struvite) or gypsum from a nickel production plant. The magnesium sulphate can be sold as a magnesium source, the high-quality magnesium hydroxide could be used as a flame retardant, and struvite is a good fertiliser. A 80 $m^3$/h plant is currently being built at a hydro-nickel plant in Guangxi, South China. The first stage (magnesium sulphate recovery) is already commercially operational, and the second stage (magnesium hydroxide recovery) is being built.

*"Recovery of Magnesium from Waste Effluent in Nickel Laterite Hydrometallurgy Process", N. Sun et al., EPD Congress 2012, TMS (The Minerals, Metals & Materials Society)*
*http://onlinelibrary.wiley.com/doi/10.1002/9781118359341.ch49/summary*

## Durable fire-safe cable protection for solar energy

Thomas & Betts have installed PMAFLEX, conduit type XSOLL, long-life cable protection in a 241 panel, 52 000 kWh/y photovoltaic plant in Uster, Switzerland. The fire-safety characteristics of the cable protection (self-extinguishing, UL94 V2, UL224, IEC EN 61386 non flame propagating) enabled building authority authorities to waive the individual safety switching requirement for each panel. The XSOLL cable protection corrugated conduits are triple-layered (PA12 outer layer for highest UV resistance, PA6 inner layer), formulated with PIN FRs (phosphorus, inorganic, nitrogen flame retardants) and offer long life (>25 years), good mechanical strength at -40 - +150°C, UV and weathering resistance.

*Source* *http://www.pma.ch/pma_com/products/pmaflexpro/xsoll.html*

## Novel PIN retardant for cotton and cellulose

A new type of PIN flame retardant has been developed for application to cotton and cellulose fibres. The halogen and formaldehyde free PSiN (phosphorus silicon nitrogen) or Neo-FR was synthesised from silicon, phosphorus and nitrogen, using one or two steps including cross linking addition of phosphorus-based multi-function groups. and retained three methoxyl groups enabling self-polymerisation or covalent bonding to textile molecules. The FRs were tested on cotton fibres and showed good fire performance (vertical flammability test, LOI limiting oxygen index) through high char generation, did not significantly deteriorate the tensile strength or elasticity of the cotton samples, and was durable (wash resistant).

*"A durable flame retardant for cellulosic fabrics", Z. Yang et al., Polymer Degradation and Stability, in press 2012: http://www.sciencedirect.com . "A novel halogen-free and formaldehyde-free flame retardant for cotton fabrics", Z.Yang, Fire and Materials, vol. 36, issue 1, 2012: http://onlinelibrary.wiley.com/doi/10.1002/fam.1082/abstract*

## PIN flame retardants for lithium ion batteries

Lithium ion batteries are widely used in portable electronics in our everyday life (laptops, telephones …) and also now in electric cars, because of their high power to weight ratio. However, these batteries pose a recognised fire risk, in case of damage, electrical malfunction or overheating. A number of phosphorus-based molecules are proving to be effective flame retardant additives for lithium ion batteries. A new phosphonamidate, bis(N,N-diethyl)(2-methoxyethoxy)methylphosphonamidate (DEMEMPA), has been shown to be effective as a flame retardant (considerably reducing SET self-extinguishing time) and to not deteriorate electrochemical performance. The phosphorus-based additive DPOF (diphenyl octyl phosphate), used as a flame retardant additive in the electrolyte of lithium ion batteries, has been shown to actually improve the electrical performance.

*"Effect of flame-retarding additives on surface chemistry in Li-ion batteries", N. Nam et al., Materials Research Bulletin, in press, 2012 www.elsevier.com/locate/matresbu . "Effect of the concentration of diphenyloctyl phosphate as a flame-retarding additive on the electrochemical performance of lithium-ion batteries", E-G. Shim, Electrochimica Acta 54 (2009): www.elsevier.com/locate/electacta . "A new phosphonamidate as flame retardant additive in electrolytes for lithium ion batteries", J. Hu, J. Power Sources 197, 2012 : www.elsevier.com/locate/jpowsour*

# Other News

The **International Electrotechnical Commission (IEC) has decided against a proposed "candle flame ignition" resistance requirement** in standards for the plastic enclosures of television sets. 40% of country representatives voted against the proposal, enough to result in its rejection. pinfa regrets this decision, because small flames, such as candles and tea-lights, placed on or near televisions continue to start a significant number of home fires, including with modern flat-screen TVs. The proposed safety requirement would have prevented or considerably reduced the risk of such fires.

**A study in four USA sewage works** of 8 traditional and newer halogenated flame retardants in sewage sludge shows the presence of PBDEs, TBPH and DP* in all samples with total concentrations in the range 2 – 6 µg/g. The authors conclude that these substances can migrate out of consumer products into the environment.

**A study in Vancouver** shows that PBDEs continue to be found in household dust, with concentrations stable for the now-banned Penta-BDE and increasing for other PBDEs (concentrations up to 43 µg/g). Nine non-PBDE brominated flame retardants were also found in 81-100% of dust samples (median concentrations 0.003 – 0.3 µg/g).

**A study published by the Scandinavian countries**, assesses 17 different halogenated flame retardants used to substitute PBDEs* in a range of urban and rural environments, including indoor and outdoor air, and in wildlife. These "new" halogenated FRs were regularly found and undergo long range environmental transport. The authors suggest further studies to identify emission sources and pathways.

**A study of airborne particles in the Arctic and Antarctic regions** found traces of organophosphorus flame retardants. 75 – 85% of the concentrations detected were chlorinated substances (TCEP and TCPP), with PIN (non-halogenated) phosphorus flame retardants being found at much lower concentrations of <100 picogrammes/$m^3$ (e.g. TiBP, TnBP, TEHP, TPhP*)

*IEC vote:*
*http://www.iec.ch/dyn/www/f?p=103:52:0::::FSP_ORG_ID,FSP_DOC_ID,FSP_DOC_PIECE_ID:1311,139509,269491*

*EFRA statement : http://www.cefic-efra.com/images/stories/Position_Paper/2012-04-27_efra%20statement_iec-standard.pdf*

*"Measurement of flame retardants and triclosan in municipal sewage sludge and biosolids", E. Davis, Environment International 40 (2012) 1–7 , Elsevier: www.elsevier.com/locate/envint and http://www.sourcewatch.org/images/7/73/Measurement_of_flame_retardants_and_triclosan_in_municipal_sewage_sludge_and_biosolids.pdf*

*"Legacy and current-use flame retardants in house dust from Vancouver, Canada", M. Schoeib et al., Environmental Pollution 2012, in press : www.elsevier.com/locate/envpol*

*"Brominated Flame Retardants (BFR) in the Nordic Environment", M. Schlabach et al., NORDEN (official Nordic cooperation organisation), 18th Aug. 2011: http://www.norden.org/en/publications/publikationer/2011-528*

*"Organophosphorus Flame Retardants and Plasticizers in Airborne Particles over the Northern Pacific and Indian Ocean toward the Polar Regions: Evidence for Global Occurrence", A. Möller et al., Environmental Science & Technology 46, 2012, http://pubs.acs.org/journal/esthag*

* PBDE: Poly Brominated Diphenyl Ethers). TBPH: di(2-ethylhexyl)-2,3,4,5-tetrabromophthalate. DP: Dechlorane Plus. TiBP: tri-iso-butyl phosphate. TnBP: tri-n-butyl phosphate. TPhP: triphenyl phosphate.

# Agenda

Events with active pinfa participation are marked: ►

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| ********** 2012 ********** | | |
| 29 Jul – 3 Aug | Warsaw, Poland | 34th International Symposium on Combustion http://www.combustion2012.itc.pw.edu.pl/ |
| 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 |
| 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 |
| 24-26 Jun 2013 | Windsor, UK | Interflam 2013 www.intersciencecomms.co.u |