

Global Perspectives on Flame Retardants for Textiles: pinfa's Role in Advancing Safety and Innovation

Adrian Beard

pinfa conference, Shenzhen, China

12 December 2025

Cefic sector group 



Who is pinfa?

- The **Phosphorus, Inorganic and Nitrogen Flame Retardants Association**.
- Has 28 members: **manufacturers and users** of the three major technologies of non-halogenated flame retardants.
- Established in 2009 as a Sector Group within **Cefic**, the European Chemical Industry Council.
- **pinfa-NA** and **pinfa China**, sister associations, established respectively in 2012 and 2018.
- Mutual membership with **INEMI**¹ and partnership with **GTFI**², **EAPFP**³, **EuroFSA**⁴



(1) International Electronics Manufacturing Initiative

(2) Groupement Technique Français contre l'Incendie

(3) European Association for Passive Fire Protection

(4) European Fire Safety Alliance

Pinfa Members: EU, China & North America



pinfa Europe Executive Committee 2026



Our new pinfa Executive Committee

- Adrian Beard (Clariant), Thomas Futterer (Budenheim), Sander Kroon (ICL)
- Francesca Filippini (Cefic), Zarah Fahimi (Huber), Esther Agyeman-Budu,



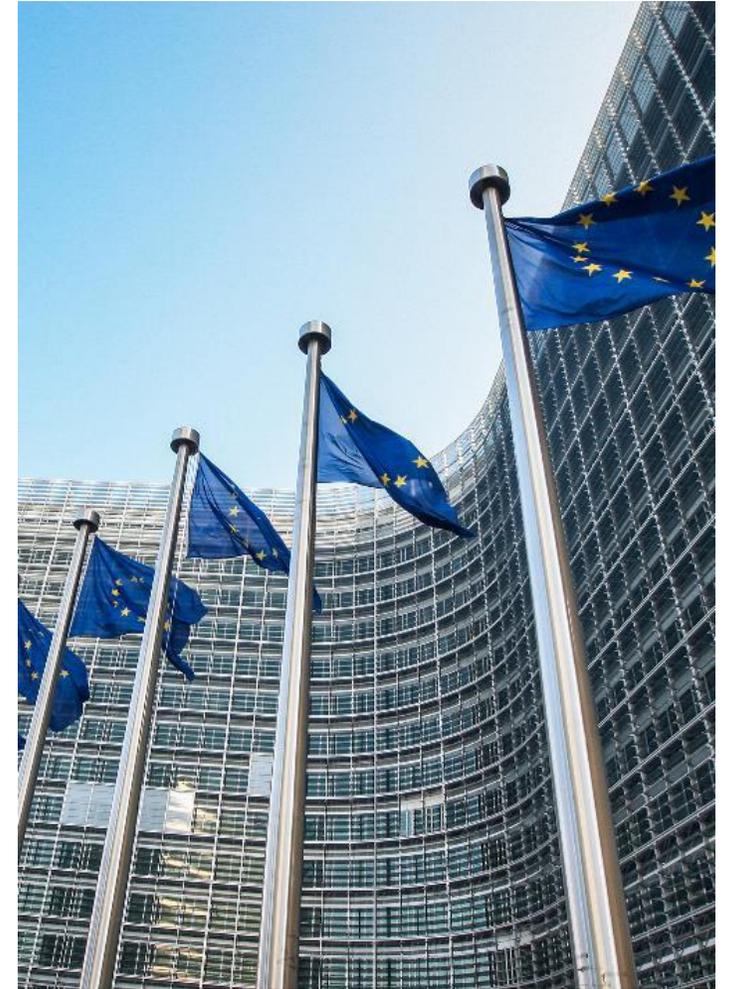
Our Mission

- Promote the use of PIN FRs (**P**hosphorus, **I**norganic & **N**itrogen Flame Retardants)
- Provide information to users, legislators and other interested parties on safety, health and environmental issues related to PIN FRs
- Work with industry partners, associations and other stakeholders to support the safety and sustainability of PIN FRs
- Carry out research relevant to safety and sustainability



Europe is very active on chemical regulation

- PFAS
- REACH and CLP (Classification & Labelling)
- ECHA (European Chemicals Agency)
 - Flame Retardants Regulatory Strategy
 - Report on aromatic brominated Flame Retardants (aBFR)
- ESPR (Ecodesign and Sustainable Products Regulation)
 - Substances of Concern (SoC) concept



Source: Shutterstock



REACH revision has been postponed several times

- Generic Risk Approach
- Reform of authorisation & restriction
- Registration of (some types of) polymers
- Compliance check of all dossiers / revocation non-compliant dossiers
- Mixture Assessment Factor
- ...
- Will a draft still come in early 2026?



AI generated, 2023-10-20



Classification & Labelling: New Hazard classes

New Hazard Classes for:

- Endocrine Disruptors (ED) for human health and environment
 - Persistent Bioaccumulative and Toxic (PBT) and very Persistent and very Bioaccumulative (vPvB)
 - Persistent Mobile and Toxic (PMT) and very Persistent and very Mobile (vPvM)
 - [CLP Delegated Act](#) published 2023-03-31*
 - Guidance documents have been published
- More substances will become SVHC



ECHA Helsinki, ©A. Beard

*COMMISSION DELEGATED REGULATION (EU) 2023/707 of 19 December 2022 amending Regulation (EC) No 1272/2008 as regards hazard classes and criteria for the classification, labelling and packaging of substances and mixtures



ECHA published FR Strategy



Regulatory strategy for flame retardants

March 2023

ECHA Strategy identifies several PIN flame retardants as low hazard, no regulatory action needed



ECHA raises environmental concerns over certain aromatic brominated flame retardants

ECHA/NR/24/40

The European Chemicals Agency's (ECHA) investigation found that use of non-polymeric aromatic brominated flame-retardant additives pollutes the environment due to their persistence, bioaccumulation and toxicity. These substances are released to the environment throughout the product lifecycle, with waste stage being of particular concern.

Helsinki, 18 December 2024 – ECHA has investigated, as requested by the European Commission, the uses and releases of aromatic brominated flame retardants (ABFRs), and their (potential) hazardous properties. It has also considered possible alternatives and aspects related to recycling and waste management.

[ECHA news item](#)
[Report \[PDF\]\[EN\]](#)
[Appendix A-E \[PDF\]](#)
[Appendix F \[XLSX\]](#)
[Appendix G \[XLSX\]](#)
[Appendix H \[XLSX\]](#)

Current activities on restrictions: aromatic brominated and organophosphorus flame retardants



The European Commission has requested us to prepare:

- a restriction report on *non-polymeric additive aromatic brominated flame retardants*; and
- an investigation report on *organophosphorus flame retardants* and potential alternatives to certain *aromatic brominated flame retardants*.

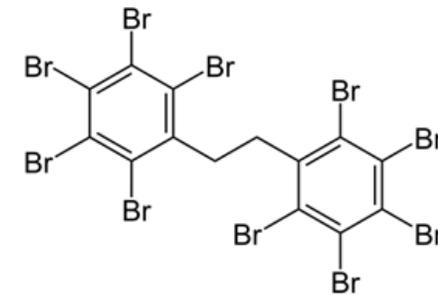
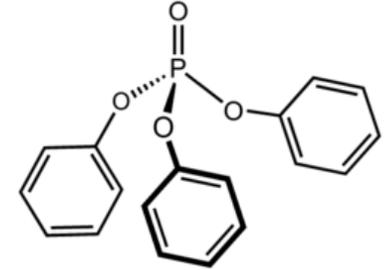
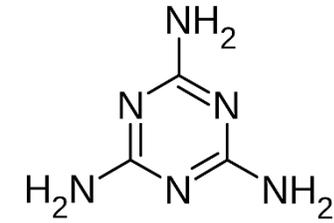
We plan to submit the restriction proposal by **11 December 2026**.

The investigation will result in two separate reports: the first one is due by **December 2026** and the second by **December 2027**.



Substances of Very High Concern (SVHC)

- Melamine
- Triphenylphosphate (TPP)
- Decabromo diphenylethane (DBDPE)



- <https://chem.echa.europa.eu/obligation-lists/candidateList>

pinfa frequently asked questions (FAQ) about melamine-based flame retardants and recent regulatory risk management measures on melamine:

[pinfa-Melamine-based-FRs_QA.pdf](#)

EFPA (European Melamine Producers Association) Regulatory Status information <https://melamine.cefic.org/regulatory-status/>

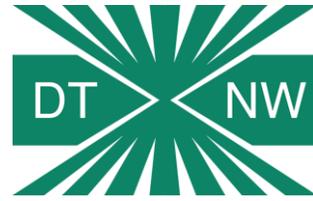


Textile Flame Retardants

*Textiles in public buildings or transport applications are subject to specific fire safety requirements.
Photos: Shutterstock*



German Textile Research Center North-West (DTNW)



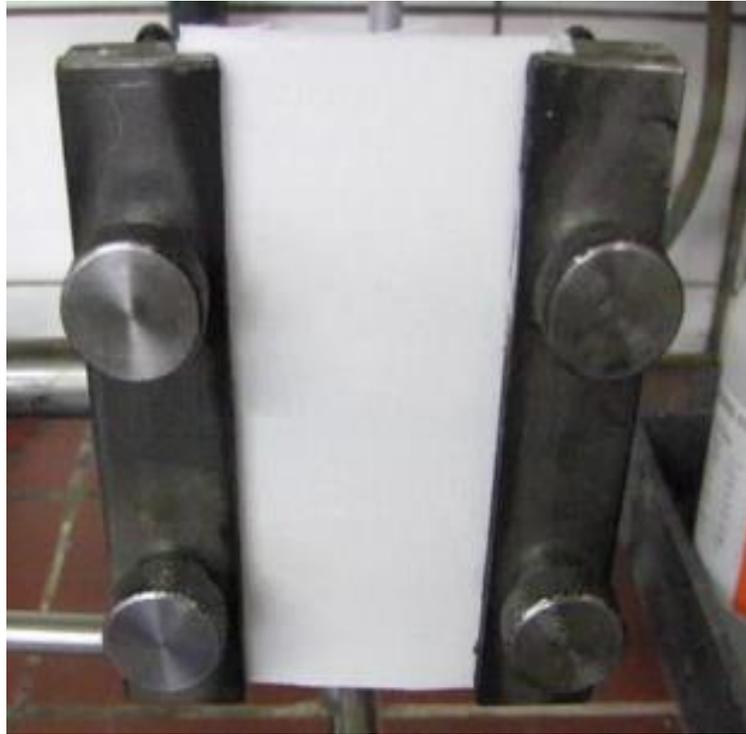
Thanks for providing
information



- Research institute
- Dr. Thomas Mayer-Gall
- Associated member:

- University of Applied Sciences (HNR)
- University of Duisburg-Essen (DUE)

How do fabrics burn?



Cotton



PET



Cotton/PET
50:50



Recent Trends in Flame Retardants for Textiles

- Shift toward sustainable and environmentally friendly solutions
 - Biobased & renewable products
 - recycling
 - low PCF products
 - ATO & halogen free products
 - low formaldehyde or formaldehyd free products
- Innovations in PIN flame retardants
 - i.e. inherent FR polymers/fibers

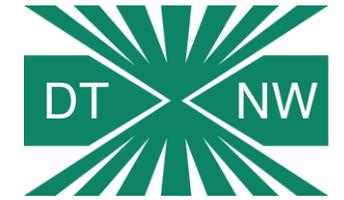
(thanks to Volker Butz, Thor company, for input)



Photo © Shutterstock



PIN FR Chemistries

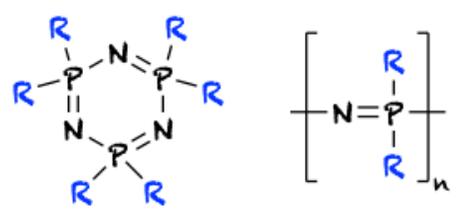


● Backbone Scaffolds

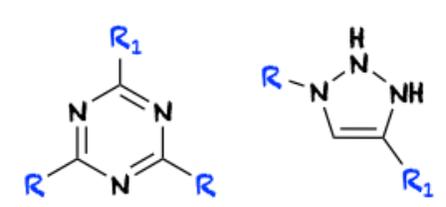
Bio-based



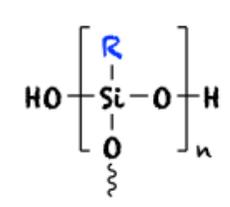
Cyclo- & Polyphosphazenes



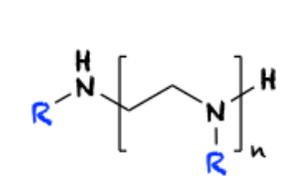
Triazine / Triazole systems



Organosilanes



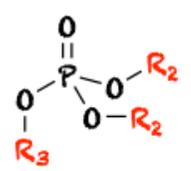
Oligo-/Polyamines



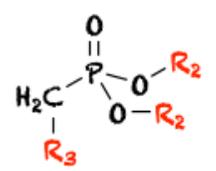
R/R1: flame-retardant functional and/or anchoring groups

● Functional Flame-Retardant Components

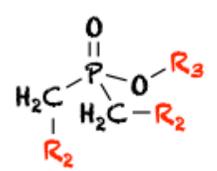
Phosphate



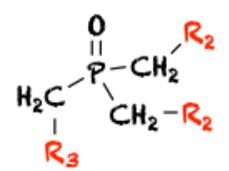
Phosphonate



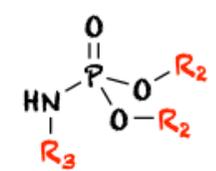
Phosphinate



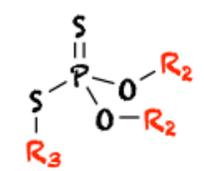
Phosphine oxide



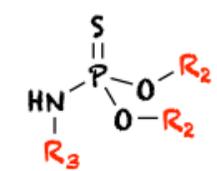
Phosphoramidate



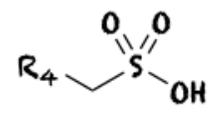
Dithiophosphates



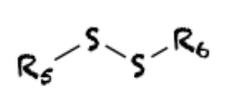
Thiophosphoramidate



Sulfonates



Disulfides



Smoke Suppressants

Metal Oxides
B-Compounds

Synergistic Systems

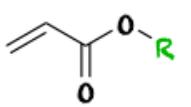
P-N P-S N-S

Intumescent Systems

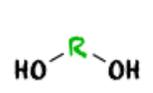


● Anchoring / Integration Groups

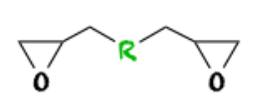
Acrylate



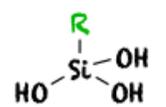
Polyols



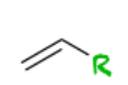
Epoxide



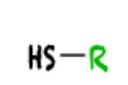
Silane



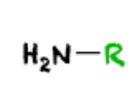
Vinyl



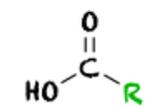
Thiol



Amine



Carboxyl



New Tests and Requirements for textile FRs

- Specific requirements for different textile applications (apparel, home textiles, technical textiles)
 - workware (FR jackets, trousers for metalworking/oil industry; durable)
 - curtains, sunblinds, bedlinen (i.e. highrise hotels)
 - pillows, seat cover, carpets (aircraft, ships, railway)
- Testing methodologies and certification processes, depending on
 - application (i.e. B&C => Euroclass; aircraft => FAR; ships: IMO)
 - place of use (i.e. wall, floor, ceiling)
 - hazard level (i.e. railway HL1, 2, 3)
- certification from accredited testing facility
- Balancing safety requirements with performance and sustainability
- Light weight with FR vs heavy material (metal, minerals, leather, wood); i.e. facades, cars, trains, ships)



Cone calorimeter fire test. Photos courtesy of Fire Testing Technology, UK

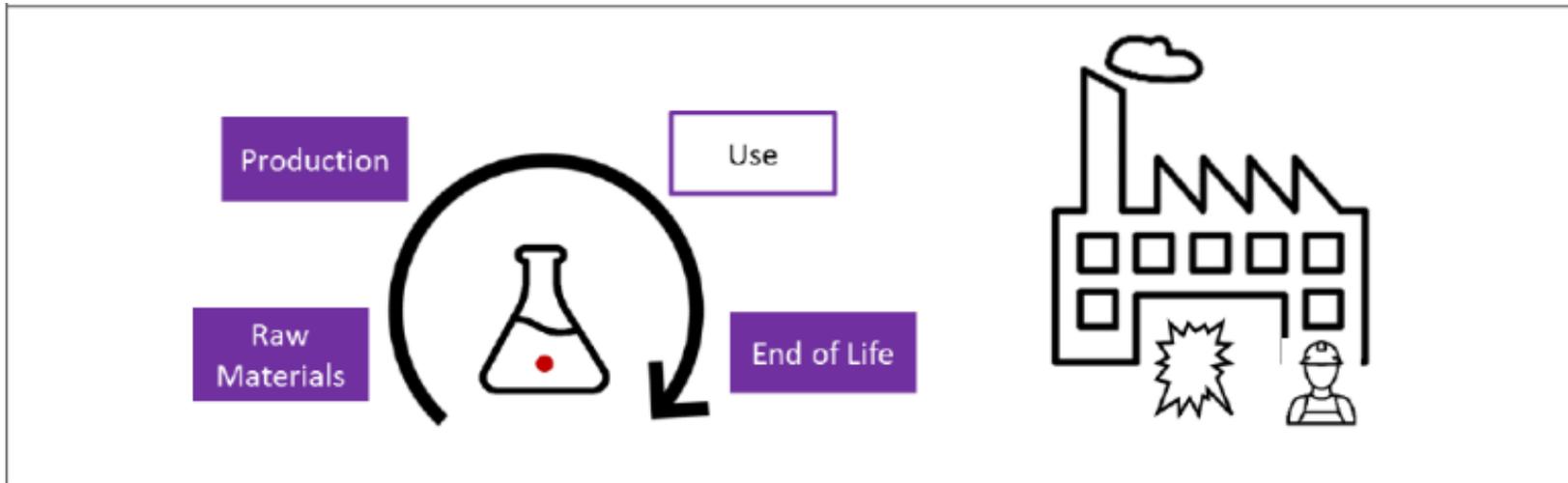


SAFE AND SUSTAINABLE- BY-DESIGN: A GUIDANCE TO UNLEASH THE TRANSFORMATIVE POWER OF INNOVATION

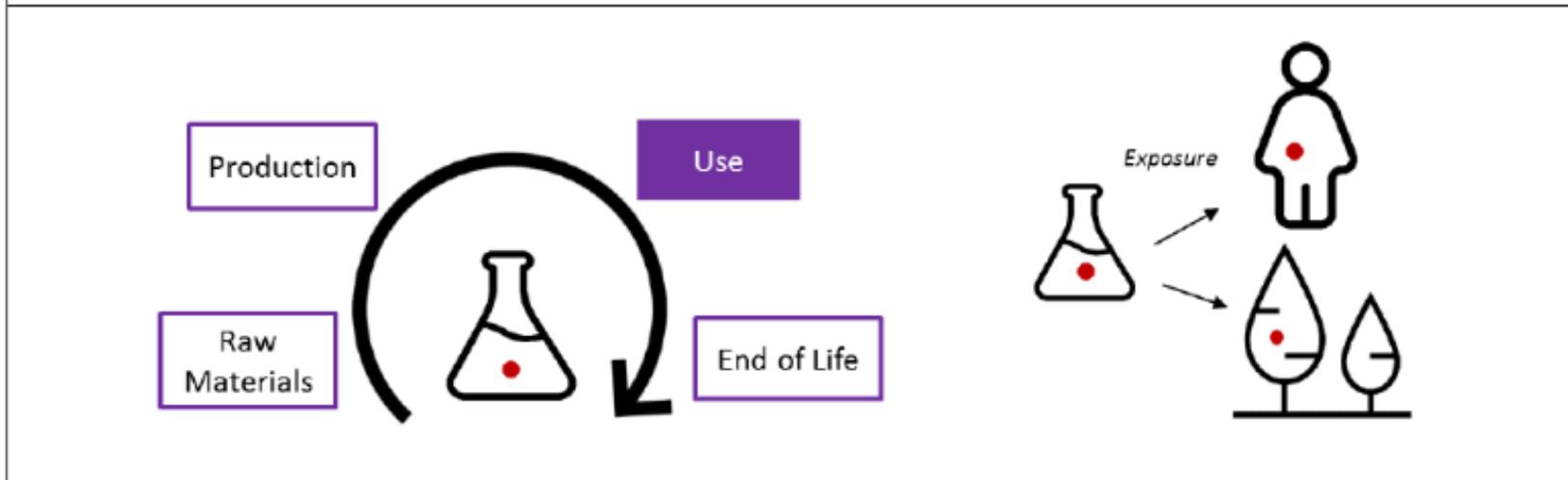
MARCH 2024



SSbD – criteria and procedure have been proposed by EU-JRC



(c) Hazards and risks related to the chemical/material final application



(d) Environmental impacts along the entire chemical/material life cycle



Cefic SSbD Guidance



What is a sustainable Flame Retardant?

Hazards

- PBT: Persistence, Bioaccumulation, Toxicity
- CMR: Carcinogenicity, Mutagenicity, Reproductive Toxicity
- Endocrine effects, Mobility (new)

Life Cycle

- Carbon footprint (global warming potential) and other Product Environmental Footprint criteria
- Production (value chain): impact on workers
- Use Phase: impact on consumers
- End-of-life → Recycling properties

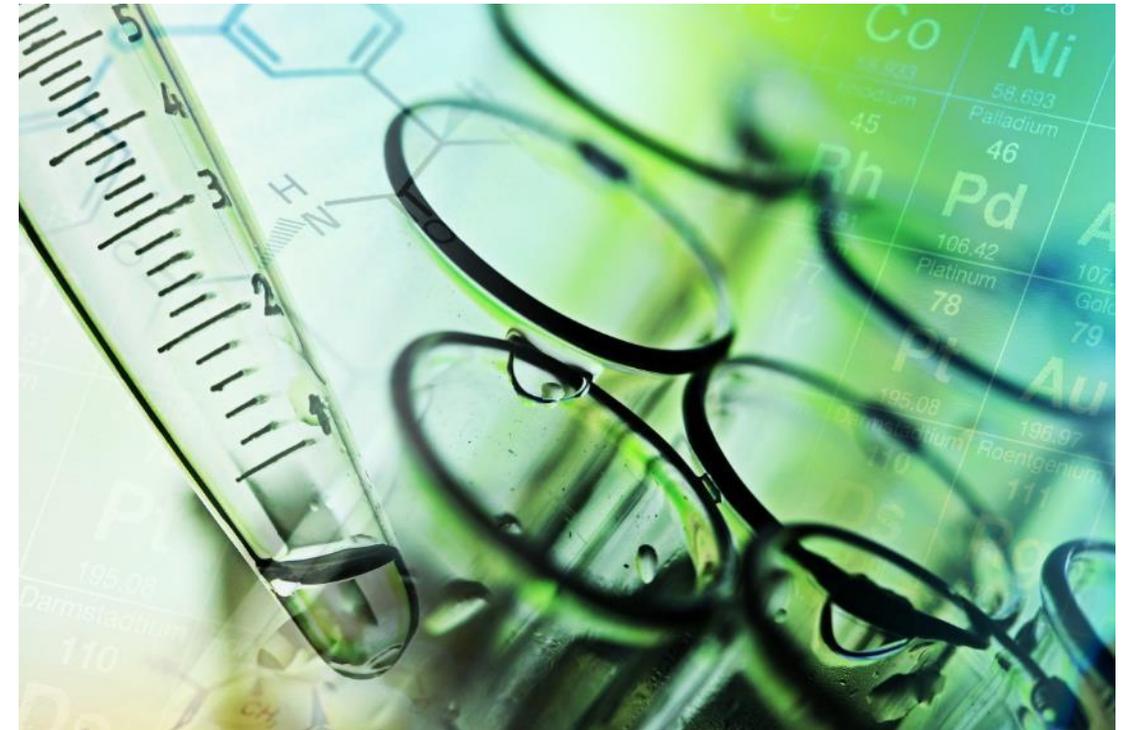
Other

- Critical raw materials
- Fires: Smoke formation / toxicity
- Social impact



Conclusion – Flame Retardants can be Sustainable

- Europe is pursuing ambitious chemical regulations
- SSbD concept
 - needs workable approach along innovation process
 - No one-size-fits-all - compromises will be needed
- pinfa:
 - input and support
 - build trust in FRs



Source: Shutterstock





www.pinfa.org



[www.linkedin.com/company/
pinfa-sector-group-of-cefic/](https://www.linkedin.com/company/pinfa-sector-group-of-cefic/)

Pinfa website and social media:

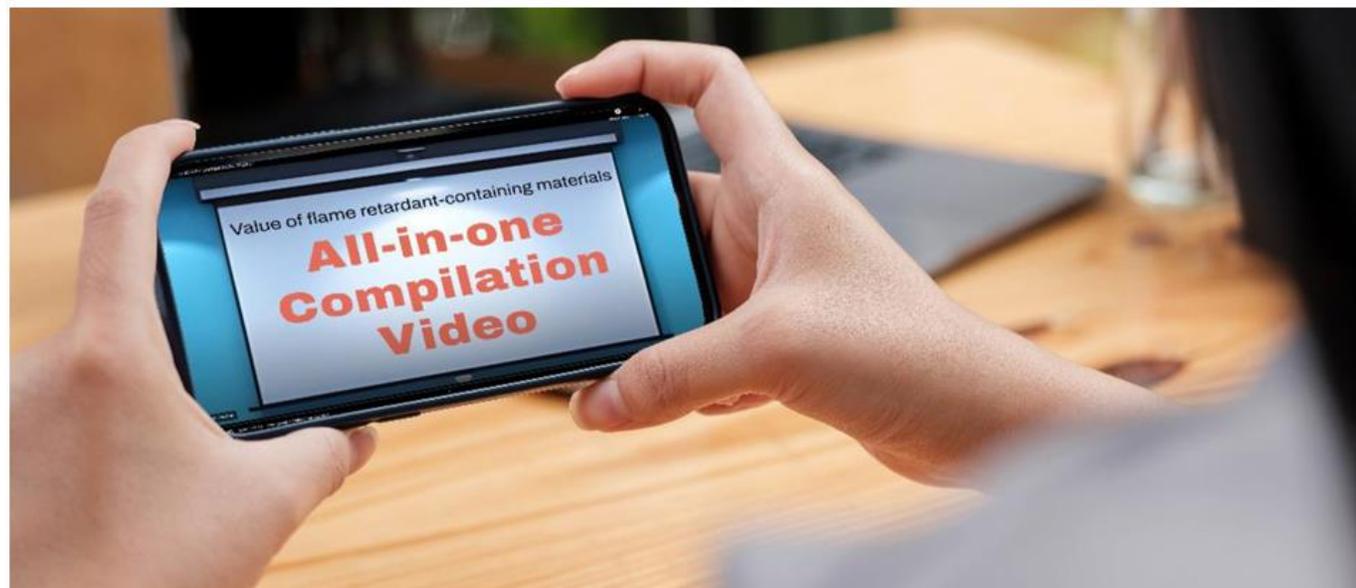
- Monthly newsletter sign-up
- Technical info on Flame Retardants
- Product Finder



A sector group of Cefic 

European Chemical Industry Council - Cefic aisbl

Videos explaining Flame Retardants – Video #10 now released!



Our brand-new **All-in-One Compilation Video** brings together the best insights from our complete 10-part Learn Flame Retardants series into one concise, training-ready highlight reel, perfect for sharing with your team or refreshing your own knowledge.

[Watch Now](#)

pinfa North America
Phosphorus, Inorganic & Nitrogen Flame Retardants Association



pinfa animated logo



Thank you.

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About Cefic

Cefic, the European Chemical Industry Council, founded in 1972, is the voice of large, medium and small chemical companies across Europe, which provide 1.2 million jobs and account for 15% of world chemicals production. Cefic members form one of the most active networks of the business community, complemented by partnerships with industry associations representing various sectors in the value chain. A full list of our members is available on the Cefic website.

Cefic is an active member of the International Council of Chemical Associations (ICCA), which represents

chemical manufacturers and producers all over the world and seeks to strengthen existing cooperation with global organisations such as UNEP and the OECD to improve chemicals management worldwide

Cefic sector group 

The European Chemical Industry Council, AISBL – Rue Belliard, 40 - 1040 Brussels – Belgium
Transparency Register n°64879142323-90



References and Further Reading

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