POSITION PAPER

June 2026

Trace amounts, clarifying frequent misconceptions: Why PIN Flame Retardants are not intentionally added to most toys

Introduction

In recent years, Phosphorus, Inorganic and Nitrogen flame retardants (PIN FRs) have been the subject of significant media attention and scrutiny in scientific literature. A frequent concern is the alleged presence of PIN flame retardants in children's toys, suggesting that this constitutes a health risk due to exposure to children. While protecting children from potential chemical hazards is an important and legitimate goal, these claims often lack scientific grounds and fail to acknowledge the fundamentals of fire safety standards and practical realities of toy manufacturing. This position paper aims to clarify misconceptions and explains where and why flame retardants must be used only in certain toys and when their presence is intended as relevant for the safety of children. Furthermore, this paper gives a realistic insight on sources for traces of PIN flame retardants in toys.

Only some specific types of toys have flammability requirements which can be met by adding flame retardants

Contrary to popular belief, there is no legislation or safety standard in the EU, US, or other global jurisdictions that mandates the use of PIN flame retardants in toys in general. Fire safety standards such as EN 71-2 (Safety of Toys - Flammability) and ASTM F963 (Standard Consumer Safety Specification for Toy Safety) only apply to specific toy categories, e.g. certain costumes, electrical toys, and electrical or electronic devices which contain batteries [1,2]. To meet these fire safety requirements, the manufacturer may choose to use (PIN) flame retardants. The vast majority of plastic toys are not subject to any fire resistance criteria and, therefore, have no requirement nor benefit from the inclusion of PIN flame retardants. In November 2025, the EU adopted the Toy Safety Regulation (EU) 2025/2509, which replaces the Directive. It entered into force on 1 January 2026, with application after a transition period (from August 2030). The chemical requirements in Annex II, Part III of the Toy Safety Regulation have been significantly tightened. In addition to the existing prohibition on CMR substances, bans now also apply to endocrine disruptors, respiratory and skin sensitisers, and substances toxic to a specific organ. The new regulation also tightens migration limits and thresholds for substances in polymeric, wood, leather, and water-based materials, and lists also a number of particulate harmful substances with specific thresholds.

Trace PIN flame retardants likely originate from recycled plastics or alternative functions

Supporting circularity and saving resources, toys - as many other articles made of plastics - are increasingly produced using recycled plastics. These recycled plastics may come from various waste streams and thus can contain residual additives such as (legacy) flame retardants from their original use in e.g. electronics,

Pinfa Secretariat
Rue Belliard 40, Bte 15,
B-1040 Brussels – Belgium - pinfa@cefic.be
www.pinfa.eu
A sector group of Cefic
European Chemical Industry Council - Cefic aisbl
EU Transparency Register n° 64879142323-90

textiles, or building products - applications where they have to be used by regulation for fire safety reasons. These additives can persist at trace levels in secondary products like toys [5,6]. Moreover, some compounds used as flame retardants may also serve other uses / functions in a plastic material, such as plasticising or UV stabilisation, making their presence multifunctional rather than strictly fire related [7]. In addition, flame retardants may be found in toys due to cross-contamination in multi-function production lines at polymer manufacturing sites where the production lines may have several outputs, flame retarded polymers for e.g. electronics next to polymers for toy production. Even though it is believed that polymer manufacturers do not take this risk of cross contamination in case of sensitive applications of their polymers, it should not be excluded per se based on the findings of traces of PIN FRs.

PIN flame retardant levels in toys are too low to provide fire safety

Analytical studies have shown that even when traces of flame retardants are detected in toys, the concentrations are too low to either confer any fire-retardant function or any other function as e.g. plasticiser or UV-stabiliser. For example, a review by the Danish EPA found that the levels of flame retardants in toys and children's products were usually below 100 mg/kg. These concentrations are clearly below the levels needed to influence fire performance [3,4], plasticizing and UV-stabilisation. This strongly suggests incidental presence rather than intentional application and suggests for improved steering - and eventually provisional control mechanisms - of recycled plastics used for the manufacture of toys.

Misinterpretation in media and semi-scientific reports

Several reports sensationalise findings of trace concentrations of chemicals in toys without addressing toxicological context or exposure levels. The mere detection of a substance does not imply harm; risk depends on both hazard and exposure. Regulatory agencies such as the European Chemicals Agency (ECHA) and the US Consumer Product Safety Commission (CPSC) base their decisions on detailed scientific risk assessments of a chemical addressing its hazard and exposure rather than the detection of a chemical alone [8,9]. Overstated media narratives can contribute to unnecessary public fear and distract from realistic exposure pathways.

Conclusion

While caution about chemical safety in children's products is essential, it is equally important to base public discourse and regulatory decisions on sound science. The narrative that toys are intentionally treated with PIN flame retardants lacks factual support. Low levels of such compounds, as detected, are more likely to be incidental and are assumed to not present an unacceptable health risk to children given the intended use of a toy. Misinformation on this topic can cause unnecessary concern among parents and consumers. A more balanced understanding is necessary; one that recognises the complexity of material sourcing, the multifunctional use of additives, and the rigor of existing safety frameworks.

Therefore, the presence of trace concentrations of PIN flame retardants in toys does neither indicate intentional use, nor does it necessarily pose an unacceptable risk to children’s health.

pinfa members are available for any questions and open for discussion.

Who is pinfa?

pinfa, the Phosphorus, Inorganic, and Nitrogen (PIN) Flame Retardants Association, represents the producers and users of a group of non-halogenated phosphorus, inorganic and nitrogen flame retardants. It is a Sector Group of Cefic. The members of pinfa share the common vision of continuously improving the environmental and health profile of their flame retardant products.

References

1. European Committee for Standardization, EN 71-2:2020 Safety of Toys - Part 2: Flammability.
2. ASTM International, ASTM F963-23: Standard Consumer Safety Specification for Toy Safety.
3. Danish EPA (2015), Survey and Health Assessment of flame retardants in Toys and Childcare Articles, Environmental Project No. 1636.
4. Danish EPA (2006), Survey, migration and health evaluation of chemical substances in toys and childcare products produced from foam plastic, DTC Health and Environment, a business unit of DHI Water and Environment, No. 70.
5. Ruirui Z., Ningqi L., Juan L., Chunyan Z., Yadan L., Yawei W., Guibin J. (2022), "Percutaneous absorption and exposure risk assessment of organophosphate esters in children's toys", *J Hazard Mater.; 440:129728*
6. Kemmlein, S., Hahn, O., & Jann, O. (2003), "Emissions of organophosphate and brominated flame retardants from selected consumer products and building materials." *Atmospheric Environment*, 37(39-40), 5485-5493.
7. van der Veen, I., & de Boer, J. (2012), "Phosphorus flame retardants: Properties, production, environmental occurrence, toxicity and analysis" *Chemosphere*, 88(10), 1119-1153.
8. ECHA (2020), Guidance on Information Requirements and Chemical Safety Assessment.
9. US Consumer Product Safety Commission (CPSC) (2017), Chronic Hazard Advisory Panel on Phthalates and Phthalate Alternatives Final Report.
10. Stapleton, H. M., et al. (2012), "Exposure to flame retardant chemicals on hand wipes and house dust in toddlers", *Environmental Health Perspectives*, 120(7), 904-909.