PFAS PUBLIC CONSULTATION: BRIEF PLASTIC COMPOUNDS AND MASTERBATCH

Brussels, 25 September 2023

***EuPC** is the leading EU-level Trade Association, based in Brussels, representing European Plastics Converters. EuPC now totals about 51 European Plastics Converting national and European industry associations, it represents close to 50,000 companies, producing over 50 million tonnes of plastic products every year. The European plastics industry makes a significant contribution to the welfare in Europe by enabling innovation, creating quality of life to citizens and facilitating resource efficiency and climate protection. More than 1.6 million people are working in about 50,000 companies (mainly small and medium-sized companies in the converting sector) to create a turnover in excess of 280 billion € per year*

*Created in 2001 at the initiative of 15 major European MasterBatch and Compounds producers, the European Masterbatchers and Compounders (**EuMBC**) is a sector group of the European Plastics Converters, and is particularly active in all the fields related to the plastic industry (REACH, Food Contact, New Technologies). EuMBC compounders and masterbatchers provide effective solutions to the plastic converters in a safe way. Enhancing the properties of the original raw materials and providing a wide range of colours and solutions, EuMBC members are present in all the market (Packaging, Building & Construction, Food Packaging, Health Care, Automotive, Electrical & Electronic, to name but a few).*

General comment

Following our initial submission, EuPC comments on specific applications. Since those are very diverse, each application is covered in a separate submission. This brief addresses **European Masterbatchers and Compounders**, a plastics sector group with diverse final applications.

Use of fluoropolymers in plastics masterbatches and compounds

Due to their unique chemical and physical properties, per- and polyfluoroalkyl substances (PFAS) have been widely used in various industrial and commercial applications. Within the masterbatchers and compounders sector, we have registered the following fluoropolymer uses:

- PTFE for **(missing use)**:
  - High performance thermoplastic compounds for injection moulding articles of small dimensions, such as gears, lever arms, bushings and bearings, cams, pins, sliding surfaces, etc.; in a variety of industrial applications, mainly for chemical industries; and
  - PTFE is a non-dripping agent often used together with a flame retardant polymer applications (E&E).
- PVDF HFP (Poly(vinylidene fluoride-co-hexafluoropropylene CAS 9011-17-0) ;
- 1-Propene, 1,1,2,3,3,3-hexafluoro-, polymer with 1,1-difluoroethene and tetrafluoroethene, CAS 25190-89-0)
  - Those 2 fluoropolymers are used as additive allowing thin polyolefin film extrusion **(identified use not derogation proposed)**. See our brief on fluoropolymers in plastics packaging and food contact materials and fluoropolymers in construction. We will therefore not focus on those in this briefing.

Toxicity

Fluoropolymers are very stable because of their intrinsic physicochemical properties. If lost in the environment, they are therefore currently considered as persistent. However, they do not display any hazardous property/property of concern referred to by the dossier submitter; i.e., bioaccumulation, mobility, long-range transport potential (LRTP), accumulation in plants, ecotoxicity, endocrine activity/endocrine disruption, effects on human health and concerns triggered by a combination of these properties.

Moreover, **PTFE**, as a fluoropolymer, meets the OECD criteria for polymers of low concern [1]. Regarding residual monomers in articles made from fluoropolymers, it is theoretically possible that small quantities of residual monomers can migrate from finished products.

[1] Henry, B.J., Carlin, J.P., Hammerschmidt, J.A., Buck, R.C., Buxton, L.W., Fiedler, H., Seed, J. and Hernandez, O. (2018), A critical review of the application of polymer of low concern and regulatory criteria to fluoropolymers. Integr. Environ. Assess. Manag., 14 ; 316-334. *https://doi.org/10.1002/ieam.4035]*

Fluoropolymers should be excluded from the scope of the restriction

Based on the non-toxic properties described above, fluoropolymers should in our view be excluded from the scope of this restriction. We however provide additional information showing both its negligible emission and the disproportionate socio-economic impact that would be linked to its substitution.

Needed transition period and inclusion in the proposed derogation

In case fluoropolymers would not be derogated, the following minimum transition periods should be considered:

High performance thermoplastic compounds for injection moulding articles of small dimensions:

Minimum 10 years

Use as non-dripping agent in combination with flame retardant (E&E): 3 years

Use of fluoropolymer additives for thin polyolefin films extrusion (see separate submission on packaging and FCM):

	Allowed maximum fluoropolymer concentration
EiF+ 6.5 to 10.5 years	350 ppm
EiF+ 10.5 to 11.5 years	150 ppm
EiF + 12.5 years	100 ppm

There is currently considerable uncertainty whether or not suitable alternatives can be Implemented at industrial level within the proposed transition periods. The restriction should therefore include a review clause and process whereby it may be evaluated whether or not the alternatives could be successfully placed on the market potentially allowing if needed extension of those transition periods.

Note: the following sections numbers correspond to the sections numbers from ECHA's Comments for Annex XV restriction report for Per- and polyfluoroalkyl substances (PFAS).

1. Sector and sub-use

This comment is related to the following use: Plastic components containing PFAS used in the European Masterbatchers and Compounders industry.

The following fluoropolymers have been reported as used in masterbatches and compounds:

- PTFE for:
    - High performance thermoplastic compounds for injection moulding articles of small dimensions, such as gears, lever arms, bushings and bearings, cams, pins, sliding surfaces, etc.; in a variety of industrial applications, mainly for chemical industries; and
    - PTFE is a non-dripping agent often used together with a flame retardant in polymer applications
- PVDF HFP (Poly(vinylidene fluoride-co-hexafluoropropylene CAS 9011-17-0) ;
- 1-Propene, 1,1,2,3,3,3-hexafluoro-, polymer with 1,1-difluoroethene and tetrafluoroethene, CAS 25190-89-0)
    - **Those 2 fluoropolymers are used as additive allowing thin polyolefin film extrusion. See our brief on fluoropolymers in plastics packaging and food contact materials and fluoropolymers in construction. We will therefore not focus on those in this briefing.**

2. Emissions during the end of life

Fluoropolymers used in chemical industry are mostly incinerated with energy recovery (83%). 13% are landfilled. The balance is recycled [2].

Fluoropolymers being very stable an in the polymeric form, migration is assumed to be negligible. One reference that could be taken is the OECD exposure scenario document for plastics, whereby fluoropolymers would very much behave as polymeric impact modifiers. Releases during landfilling are assumed as 0% [3].

Residual oligomers for PTFE are "negligible" and monomer content <1 ppm [and this seems to be the case across fluoropolymers [4].

Given also the glassy nature of fluoropolymers, leaching of residuals from those would be greatly slowed down. Fluoropolymers being firmly bound in the polymer matrix, they are not expected to leach.

[2] Fluoropolymer Waste in Europe 2020 – End-of-life (EOL) Analysis of Fluoropolymer Applications, Products and Associated Waste Streams." Final Report Made on Behalf of pro-K, Conversio. July 2022., *https://www.ft.dk/samling/20222/almdel/euu/spm/49/svar/1951975/2698345.pdf]*

[3] OECD Environment Health and Safety Publications (2009), Series on Emission Scenario Documents No. 3, Emission Scenario Document Plastics additves, https://www.oecd-ilibrary.org/docserver/9789264221291-en.pdf?expires=1694011368&id=id&accname=guest&checksum=511DD8B4F91DB362643FB439D0FFFC79

[4] Henry, B.J., Carlin, J.P., Hammerschmidt, J.A., Buck, R.C., Buxton, L.W., Fiedler, H., Seed, J. and Hernandez, O. (2018), A critical review of the application of polymer of low concern and regulatory criteria to fluoropolymers. Integr Environ Assess Manag, 14: 316-334. https://doi.org/10.1002/ieam.4035

For behaviour in incineration, see the next section.

3. Emissions from incineration

Incineration above 850°C does not release PFAS-related materials nor detectable levels of Trifluoroacetic acid (TFA) [5-8]**.** Those temperatures can be found in municipal waste incinerators, as they are mandatory according to the Industrial Emissions Directive 2010/75/EU (Article 50), which prescribes that waste incineration plants must be designed to ensure that flue gases reach a temperature of at least 850 °C for at least 2 seconds in order to ensure the proper breakdown of toxic organic substances).

[5] Aleksandrov, K. Waste Incineration of Polytetrafluoroethylene (PTFE) to Evaluate Potential Formation of Per- and Poly-Fluorinated Alkyl Substances (PFAS) in Flue Gas. 2019, 226, 898-906., DOI: *https://doi.org/10.1016/j.chemosphere.2019.03.191*

[6] Taylor, P. H. Investigation of Waste Incineration of Fluorotelomer-Based Polymers as a Potential Source of PFOA in the Environment. Chemosphere 2014, 110, 17-22, DOI: *https://doi.org/10.1016/j.chemosphere.2014.02.037*

[7] Bakker, J., et al. Per- and Polyfluorinated Substances in Waste Incinerator Flue Gases. Rijksinstituut voor Volksgezondheid en Milieu (RIVM) Report 2021-0143.DOI: *https://doi.org/10.21945/RIVM-2021-0143)]* (Bakker, J., et al. (2021) ibidem)].

[8] Gujarat Fluorochemicals Limited (GFL), Karlsruhe Institute of Technology (KIT) & Société Générale de Surveillance (SGS) consulted by the German Federal Environment Agency (UBA), *Incineration study on Fluoropolymers at their End-of-Life,* https://www.gfl.co.in/upload/pages/64ca54ee691b6f4a8b2649ec9c7b291f.pdf]

5. Proposed derogation tonnage and emissions

5.1. Volumes of fluoropolymers used in compounding

According to the study conducted by Conversio on behalf of ProK [9], the total amount of fluoropolymer materials sold to European product manufactures is estimated to be 40 Kt/year in 2020, whereof 9% are used in a category including additives, **compounding**, engineering polymers, and other minor applications. The volume PTFE used in the specific applications above would however be very limited.

[9] Fluoropolymer Waste in Europe 2020 – End-of-life (EOL) Analysis of Fluoropolymer Applications, Products and Associated Waste Streams." Final Report Made on Behalf of pro-K, Conversio. July 2022., *https://www.ft.dk/samling/20222/almdel/euu/spm/49/svar/1951975/2698345.pdf]*

5.2. Related emissions during converting and service life

Concerning the fluoropolymer **manufacturing stage**, the Fluoropolymers Product Group (FPG) of Plastics Europe established a program focusing on the emission reduction of non-polymeric PFAS chemicals from European fluoropolymer manufacturing, including average emission targets, promoting state-of-the-art technologies to minimize emissions and a commitment to inform downstream users of fluoropolymers on their safe handling of fluoropolymer resins [10].

During the **masterbatching, compounding and converting stage**, the spillage of pellets is negligeable, there is only presence of dustiness; although air filters reduce the risk of emitting dust, as well as the presence of filters in water drains prevents the emission into water.

Regarding potential emissions during the **service life**, the risk is negligible given the low migration rate of PTFE from the polymeric matrix. Moreover, the risk of emissions during the end-of-life is low if properly handled.

[10] The Fluoropolymers Product Group (FPG), Plastics Europe (2023), *FPG Manufacturing Programme for European Manufacturing sites, https://fluoropolymers.eu/wp-content/uploads/2023/09/FPG-Manufacturing-Programme-for-European-Manufacturing-sites-Final-September-2023.pdf*

6. Missing uses: information on socio-economic impact and analysis of alternatives

6.1. Analysis of Alternatives: technical properties

PTFE is used in plastic compounds due to their low friction, chemical resistance, high temperature, resistance, electrical insulation, flame retardancy, chemical inertness, etc; which makes them hard to be substituted in many cases.

For the aforementioned applications, using alternatives would lead to different products, changing the characteristics of these, and in some cases, bringing very different products to those with PTFE.

High performance thermoplastic compounds for injection moulding articles of small dimensions

One potential alternative to be analysed is Ultra-High Molecular Weight Polyethylene (UHMWPE). While UHMWPE shares some similarities with PTFE (Polytetrafluoroethylene), such as low friction properties, there are important differences between the two materials that make them suitable for different applications. Whether UHMWPE can replace PTFE depends on the specific requirements of the application.

Here are some key points to consider:

- Friction and Wear: Both UHMWPE and PTFE have low coefficients of friction and excellent wear resistance. However, PTFE typically has a slightly lower coefficient of friction, making it an even better choice for applications where minimizing friction is critical.
- Chemical Resistance: PTFE is known for its exceptional chemical resistance and can withstand a wider range of chemicals compared to UHMWPE. If the application involves exposure to aggressive chemicals, PTFE may be the better choice.
- Temperature Resistance: PTFE has a higher temperature resistance compared to UHMWPE. PTFE can handle continuous temperatures up to around 260°C, while UHMWPE has a lower continuous use temperature, typically around 82°C.
- Load-Bearing Capacity: UHMWPE tends to have a higher load-bearing capacity and impact resistance than PTFE. This makes UHMWPE a better choice for applications involving heavy loads or impact forces.
- Processing speed: Similar processing speed may not be achieved with UHMWPE. This leads to higher reject rates or risk in compromising final product quality.

Use as non-dripping agent in combination with flame retardant (E&E)

Alternatives tested so far, show promising results but are not applicable to all polymers.

6.2. Analysis of Alternatives: cost of substitution and alternatives availability

The additional raw materials cost involves up to 1,000 € per tonne of finished article. Likewise, the processing cost could increase by 1,000 € per tonne of finished article.

There is also question on the availability of alternative materials. One can therefore see that the economic feasibility of substitution very much depends on the end application.

6.3 Time needed for substitution/potential socio-economic effects

- **High performance thermoplastic compounds for injection moulding articles of small dimensions:** Minimum 10 years
- **Use as non-dripping agent in combination with flame retardant:** 3 years
- **Use of fluoropolymer additives for thin polyolefin films extrusion (see separate submission on packaging and FCM):**

	Allowed maximum fluoropolymer concentration
EiF+ 6.5 to 10.5 years	350 ppm
EiF+ 10.5 to 11.5 years	150 ppm
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