

## ETAD Information Notice on fluorine-containing reactive dyes (October 2023)

### Background: the PFAS discussion

The name “per- and polyfluoroalkyl substances (PFAS)” covers a vast group of synthetic chemicals that have been used in consumer products around the world since the 1950s. They are used as in nonstick cookware, water-repellent clothing, stain resistant fabrics and carpets, some cosmetics, some firefighting foams, and, generally, products that resist grease, water, and oil.

Starting from 2009, some specific groups of PFAS (e.g., perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds) have been identified as having properties of concern and restricted in different jurisdictions worldwide. However, until recently, PFAS as a whole group had not been addressed by any regulation.

Following the publication by OECD of a general PFAS definition in 2021, different regulatory bodies have decided to use it as a reference in new legislation. In particular

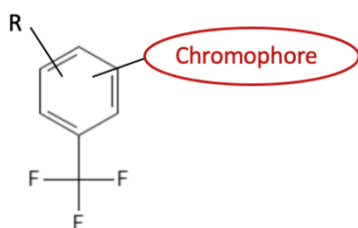
- a restriction proposal for the whole class of PFAS (with some exceptions) is currently going through the EU approval process;
- different US states has started or completed regulatory actions on PFAS<sup>1</sup>.

Some standard issuers also already adapted their requirements accordingly<sup>2</sup>.

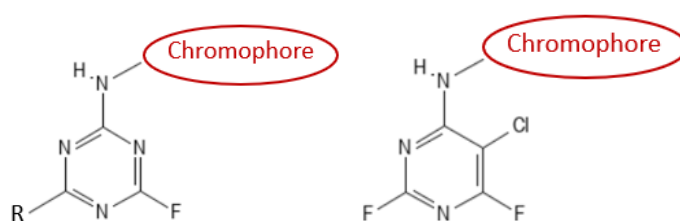
### Colorants status in the PFAS debate

There are **only a few colorants which fall under the OECD definition**; they are also not covered by the exemptions in the EU restriction proposal. They all have a  $\text{CF}_3$ - substituent on an aromatic ring, which, as a “fully fluorinated carbon atom”, qualifies the dyes as PFAS. Unless specific derogations are introduced at some point in time in the current pieces of legislation referring to this definition, these colorants will have to be taken out of the market according to the prescribed deadlines.

However, **fluorine is also a key element in the structure of non-PFAS reactive dyes** on the market, where fluorine atoms will be the leaving group in the reaction between the fiber and the colorant.



Example of a generic colorant with a  $\text{-CF}_3$  group,  
falling under OECD's PFAS definition



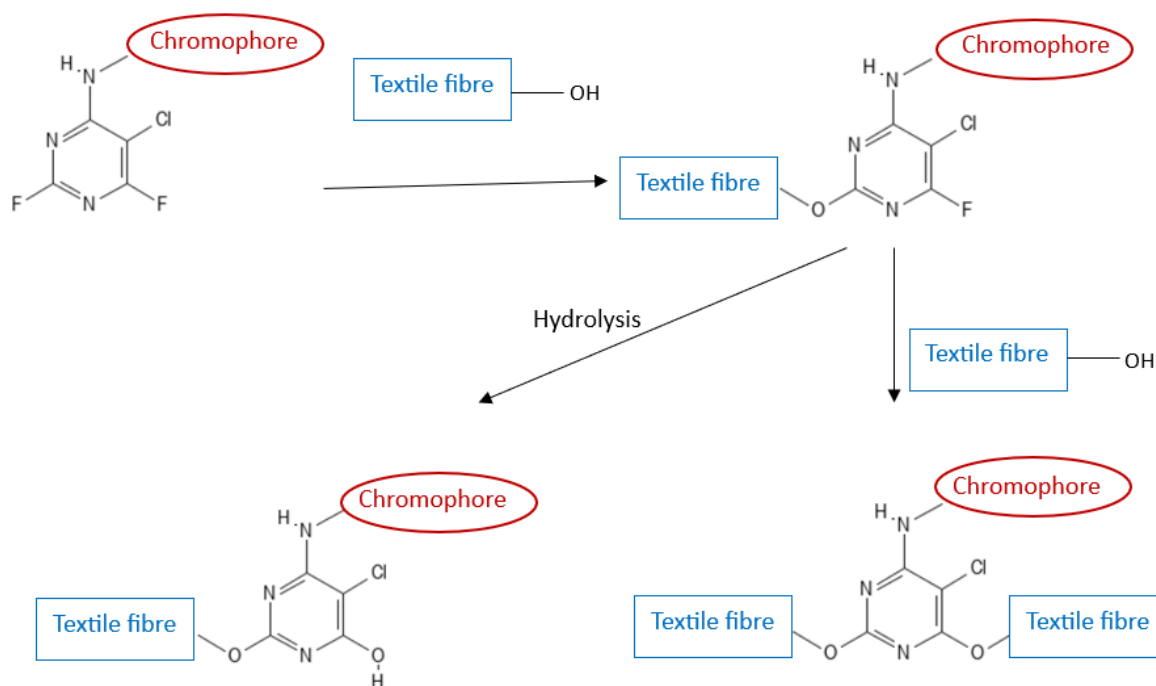
Examples of fluorine-containing reactive dyes,  
not falling under OECD's PFAS definition

<sup>1</sup> See Annex 1

<sup>2</sup> See Annex 2

## Possible presence of fluorine in textiles dyed with reactive dyes

As mentioned in the previous section, the fluorine atoms in the reactive dyes are intended to leave the dye's molecule when the fiber-colorant bond is formed or by hydrolysis after the dyeing (see schema below); similarly, unreacted dyes molecules would be hydrolyzed to their fluorine-less form. The degree of monosubstitution, double substitution (if possible) and hydrolysis depends both on the specific dye molecule and the dyeing process conditions.



Theoretically, there are two different possibilities for fluorine to remain on the final textile article:

- incomplete reaction of polyfluorinated reactive dyes;
- incomplete hydrolysis/washing out of residual dye.

These residual fluorine-containing molecules, if present, will give a positive result by any method determining total or total organic fluorine. Our companies are already checking all the available data on their products and preparing the corresponding information for their customers.

## Consequences for F-containing reactive dyes

When looking at the current different requirements, **the main effect on reactive dyes would be geographically restricted** to the three US States Maine, California and Minnesota. Since, in these jurisdictions, compliance is only based on the simple fluorine analysis, a result above the regulatory limits would immediately mean a failure for the article (all exemptions considered).

In all other cases, the fluorine analysis is used as a screening method, which needs to be followed by a targeted analysis for specific PFAS groups of concern (often with much lower limits) and **integrated by information on non-PFAS substances which could be responsible for a fluorine finding**. Therefore, providing the information on the presence of non-PFAS fluorine in the dye's molecule will avoid having an article wrongly assessed.

## Recommendation for the supply chain

The main piece of information which needs to be provided throughout the supply chain is whether a reactive dye contains fluorine. This key information should be easily available to customers and retrievable for the analytical laboratories checking for compliance.

On a higher level of communication further details can be added, depending on the data available to the dye manufacturer, e.g.:

- precise structure of the dyes;
- whether negative or positive results have been already observed in a general fluorine test by dyed textiles (be it total fluorine, total organic fluorine or extractable organic fluorine);
- measured concentrations of fluorine in the test, if available.

**NOTA BENE:** Specific analytical results would depend on the dyes, the process and the after-treatment. Therefore, any corresponding conversation must be conducted as a business communication between all the involved parties, since it might involve CBI.

## Annex 1

### Jurisdictions currently addressing PFAS and using the OECD definition as reference

	PFAS in scope	Analytical target	Limit for the general fluorine analysis	Additional conditions
EU (ongoing)	OECD definition with exemptions	Total fluorine + targeted PFAS	50 ppm	If limit exceeded, proof of non-PFAS status can be provided.
Maine	OECD definition	Total organic fluorine	Detectable	Starting January 1, 2023, fabric treatments, carpet and rugs containing intentionally added PFAS may not be sold, notification duty for other products. After January 1, 2030, no products containing intentionally added PFAS may be sold, unless determined, by rule, to be exempt because the use of PFAS is currently unavoidable in those products.
California	OECD definition	Total organic fluorine	100 ppm (until end 2026) / 50 ppm (from January 2027)	Exceptions for “outdoor apparel for severe wet conditions,” including personal protective equipment (PPE).
Minnesota	OECD definition	Not specified	Detectable	From January 2025, 11 product classes, including textile treatments, carpets or rugs, textile furnishings, upholstered furniture containing intentionally added PFAS may not be sold; notification duty for other products. After January 1, 2032, no products containing intentionally added PFAS may be sold, unless determined, by rule, to be exempt because the use of PFAS is currently unavoidable in those products.

## Annex 2

### Current PFAS requirements in relevant standards

Oekotex	OECD definition	Extractable organic fluorine + targeted PFAS	10 mg/kg	If limit exceeded, proof of non-PFAS status can be provided.
bluesign	EU restriction proposal	Total fluorine + targeted PFAS	50 mg/kg	If limit exceeded, proof of non-PFAS status can be provided.
AFIRM	OECD definition	Total fluorine + targeted PFAS	100 mg/Kg	If limit exceeded, triggered actions would depend on single brands' requirements, including EU and/or US states compliance.
GOTS	only PFOS / PFOA	Targeted PFAS	2 mg/Kg	No new requirements