



PFAS in mixtures/articles in the electronics and energy industry

Part 1 General information about company, sector and market

1.1 General information

OK

Question Title

* 1. Contact information (this information is necessary to proceed with the survey)

Name contact person *

Company *

Country

Email Address * @americanchemistry.com

Phone Number

Question Title

2. Company information

NB: The EEA (**European Economic Area**), consists of the Member States of the European Union (EU) and three countries of the European Free Trade Association (EFTA) (Iceland, Liechtenstein and Norway; excluding Switzerland).

Number of employees in EEA

Annual turnover in EEA (in €)

Question Title

3. Can we contact you for additional information?

- ☒ Yes
☐ No

Question Title

4. Please define your role(s) (more than 1 answer possible)

- ☐ Manufacturer of PFAS-containing mixtures/articles
☐ Importer into the EEA of PFAS containing mixtures/articles
☐ Downstream User of PFAS-containing mixtures/articles
☒ Other (please specify)

Question Title

5. Where does the **production or processing/use** of PFAS mixtures/articles of your company take place?

- ☐ In the EEA
☐ Outside the EEA
☐ Both in and outside the EEA

Question Title

6. How many PFAS mixture/article production/processing sites does your company have?

In the EEA

Outside the EEA

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1.2 Identity, volumes,

uses/applications and market

Question Title

7. Please provide an overview of the identity of PFAS in mixtures/articles and total volumes of PFAS containing mixture/articles.

You can enter the data in below test fields, or you can use the excel sheet that is attached to the email that you received to provide information in more detail. If you use the excel sheet, please send the file after completion to ██████████@rhdhv.com.

Identity/types of PFAS

Production volume (tonnes/year)

Import volume into the EEA
(tonnes/year)

Export volume out of the EEA
(tonnes/year)

Average concentration of PFAS (%)

Question Title

8. In which market sectors do you operate (more than 1 answer possible)?

- ☒ Electronics industry
☒ Semiconductor industry

- ☒ Energy industry
- ☒ Other (please specify)

All industry sectors use PFAS.

Question Title

9. Please provide information on the **area(s) of use/application** of your PFAS containing mixtures/articles.

You can enter the data in below test fields, or you can use the excel sheet that is attached to the email that you received to provide information in more detail. If you use the excel sheet, please send the file after completion

to rhdhv.com.

Area of use/application per identity/type of

PFAS

Among others C6 fluorosurfactants are used in/for the following applications: coating agent, photosensitive resin, color resist, release agent, adhesive, grease, filter, dispersant and batteries, facilitating the wetting, coating of hard to wet surfaces for cleaning, coating, or anti-foaming purposes. The ability to wet/penetrate high aspect microelectronic structures is facilitated by the use of fluorosurfactants. C6 fluorosurfactants can withstand the harsh acidic and alkaline processes used in semiconductor wet chemical processes.

In addition to semiconductors, C6 fluorinated surfactants are used as wetting agents in etch baths for glass substrates in electronics, due to the C6 fluorinated surfactants' low surface tension and stability in strong acids. Glass articles are polished and etched with solutions containing sulfuric acid, hydrofluoric acid and a fluorinated surfactant, which increases the speed of etching, acid polishing, or frosting of flat (sheet, plate) glass with hydrofluoric acid.

Standard appliance batteries (dry cells) and lithium battery cells use C6 surfactants as a corrosion inhibitor at the electrodes. Crystalline silicon photovoltaic modules are currently the dominant PV technology accounting for >95% of the PV market globally. There are two principal types, monocrystalline silicon and multicrystalline silicon. C6 fluorosurfactants are used for both in the saw damage removal and texturing wet chemical steps, reducing the reflectivity of the wafers to improve solar cell efficiency.

The use of C6 fluorosurfactants is vital in this process to improve the wetting of the etchants and the uniformity of the process, and to shorten the process time in addition to improving cell efficiency.

Volume of PFAS containing mixture/articles for each use/application

(tonnes/year)

Concentration or applied amount of PFAS for each use/application (e.g in %

or mg/cm²)

Function(s) of each PFAS per

use/application

Properties of the PFAS employed per

use/application

Minimum concentration or applied amount of PFAS that is necessary to maintain function per use/application (e.g. in % or

mg/cm²)

Question Title

10. How many companies do you supply with PFAS containing mixtures or articles in the EEA?

- ☐ None
- ☐ <10
- ☐ 10-50
- ☐ 50-100
- ☐ >100

Question Title

11. What percentage of those companies are Small or Medium Enterprises (SME)?

- ☐ <10 %
- ☐ 10-25%
- ☐ 25-50%
- ☐ 50-75%
- ☐ >75%

Question Title

12. What are the (expected) trends in **the annual sales of PFAS** containing mixtures and articles in the EEA?

- ☒ Increase
- ☐ Decrease
- ☐ No changes

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13. What are the (expected) trends in the **annual sales of PFAS** containing mixtures and articles outside the EEA?

- ☒ Increase
- ☐ Decrease
- ☐ No changes

14. How much of your turnover is generated by PFAS containing mixtures/articles in the EEA?

- ☐ <10%
- ☐ 10-25%
- ☐ 25-50%
- ☐ 50-75%
- ☐ >75%

Question Title

15. What is your current estimated market share in the EEA for your PFAS containing mixtures/articles (in %)? **Please provide this information; it is important for the estimates of the impacts of a restriction for the whole sector.**

In general, all industries rely on PFAS and on access to PFAS in mi

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Part 2 Environmental emissions and exposure

Question Title

16. Which of your uses/applications can lead to emissions to the environment?

All uses can lead to emissions, but at the same time all emissions
Emissions are highly limited due to a strictly controlled environme
C6 plays a crucial role in achieving the overall green deal goals, as

Question Title

17. Please list the potential pathways, release quantities and release fraction:

Question Title

18. Is there an emission scenario guidance for your sector?

- ☐ Yes
- ☐ No
- ☒ Don't know

19. Please describe the measures you are taking to reduce emissions into the environment.
If unknown, please look at the emission reduction measures specified in section 8 of your safety data sheets.

All ATCS member companies apply BAT technologies for emissior

Question Title

20. Please quantify the effectiveness of each measure (%):

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Part 3 PFAS alternatives

Question Title

21. Are you currently manufacturing, importing or using mixtures/articles containing (an) alternative(s) to PFAS?

- ☐ Yes
- ☐ No, but I am planning to manufacture, import or use (an) alternative(s)
- ☒ No

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Question Title

22. What is the name and CAS number of the **planned** alternative(s)?

Question Title

23. What is the name and CAS number of the PFAS it is replacing?

Question Title

24. How much of the alternative(s) containing mixtures/articles are you **planning** to manufacture, import or use (tonnes/year)?

Question Title

25. Could you provide a time horizon when you will be able to substitute PFAS?

- ☐ 2 years
- ☐ 5 years
- ☐ 10 years
- ☐ >10 years

Question Title

26. Based on the time horizon you have chosen, could you please provide an indication of the % of substitution?

Substitution is product specific and particularly difficult for products

Question Title

27. Please explain your reasons to (want to) substitute PFAS

Question Title

28. Are emissions to the environment expected from your (planned) alternative(s) to PFAS?

- ☐ Yes
☐ No

Question Title

29. What environmental impact do you expect of the (planned) alternative(s) to PFAS?

Alternatives are expected to have a shorter product lifespan, with
ATCS believes that the increased obligation for high energy efficiency

Question Title

30. Is it possible to achieve comparable production volumes of mixtures/articles with the (planned) alternative(s)?

- ☐ Yes
☐ No, please indicate how much less volume you are expecting to produce (in %):

Question Title

31. Is it possible to achieve the same quality of the mixture/article with the (planned) alternative(s)?

- ☐ Yes
☐ No, please indicate the decrease in quality (in %):

Question Title

32. Please list uses/applications for which changing to alternative(s) is not possible:

The whole SEMI conductor industry relies on PFAS, as do the touch

Question Title

33. What is needed to make (further) substitution of PFAS possible?

Technical requirements

Economical requirements

Question Title

34. Please list any activities/ measures that you are (under-) taking to make (additional) substitution possible?

Question Title

35. How long will it take for those measures to be implemented?

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Question Title

36. How much of the total R&D investment is related to the development of PFAS mixtures/articles?

- ☐ <10%
- ☐ 10-25%
- ☐ 25-50%
- ☐ 50-75%
- ☐ >75%

Question Title

37. How much of the total R&D is related to the development of alternatives to PFAS?

- ☐ <10%
- ☐ 10-25%
- ☐ 25-50%
- ☐ 50-75%
- ☐ >75%

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Question Title

38. Please list the most recent innovations related to PFAS in mixture/articles:

Fluorotelomer-based resins are used as Conformal Coatings, which are used for protecting electronic components. Furthermore, fluorotelomer-based resins are vital in the manufacturing of high-performance plastic parts.

Question Title

39. How will the most recent innovations impact the market?

The recent innovations will be vital for enabling the manufacturing of new products. These applications will be manufactured outside Europe and imported into the EU.

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Part 4 Socio-economic aspects

4.1 General

Question Title

40. What would be the potential costs of transitioning to alternative substance(s) for you and for your customers (in €)?

Think of cost due to price difference of raw material, redesign, re-tooling, re-engineering, part testing, loss of added value due to poorer quality, quality control, other

The substitution cost of lead is so far estimated to billions of euros.

Question Title

41. What is the average time to launch a new product in your sector when transitioning to alternative substance(s) (in years)?

Keep in mind the time needed for redesign/development, tooling, testing, registration, documentation, other.

No alternatives are available, therefore, the time needed for the transition is not applicable.

Question Title

42. What is your most likely response in case you will have to substitute?

Question Title

43. What do you think would be the most likely response of your customers in the assumed event of a restriction of PFAS?

Question Title

44. What impact do you foresee for your sector in general in case of a restriction?

There is the potential that product applications will no longer fulfil
Due to the crucial role of PFAS in the value chain of several key er

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4.2. Economic impacts

Question Title

45. What is the expected loss in EBITA (Earnings Before deduction of Interest, Tax and Amortisation) for the next 20 years for your company in case of a total restriction (in €)?

4.3 Social impacts

Question Title

46. Is a restriction expected to lead to an increase in the unemployment for your company in the EEA?

- ☒ Yes
☐ No

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Question Title

47. How many people along the supply chain in the EEA will be affected? For example in transport, distributing, storing and further downstream

The entire value chain would be affected as no alternatives with ac

Question Title

48. Do you expect other changes along the supply chain within the EEA? For example change in demand for unskilled workers, manual workers, skilled and specialist workers, management

Question Title

49. In which countries in the EEA will employees in your company risk to face unemployment?

Question Title

50. How many people will be affected in each country?

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Question Title

51. What is the average gross annual salary including the employer's social security contributions of these employees (in €)?

4.4 Wider economic impact

Question Title

52. Could you indicate whether the restriction scenario will have wider economic impacts?

For example: Certain market players might be advantaged/disadvantaged because of their location in the EEA/ outside the EEA.

Question Title

53. In case of a restriction in EEA, do you think your competitors **outside the EEA** will immediately gain market share?

- ☐ No
- ☒ Yes, please provide an explanation:

Question Title

54. Where are your competitors located?

- ☐ Within the EEA
- ☐ Outside the EEA
- ☒ Both inside and outside the EEA

Question Title

55. After the restriction, what will be their market shares in the EEA?

- ☐ <10%
- ☐ 10-25%
- ☐ 25-50%
- ☐ 50-75%
- ☐ >75%

4.5 Any additional comments

Question Title

56. Can you please list additional literature references that cover any of the aspect in this questionnaire?

[illegible]

Question Title

57. If you have any additional comments or thoughts, which are not covered by the questionnaire, please add them here:

[illegible]

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