# Joint Statement on PFAS

## Executive summary

We recognize that a restriction on Per- and Polyfluoroalkyl Substances (PFAS) is necessary due to their adverse environmental and health effects, and we therefore support and welcome the regulatory development. However, we would like to highlight the challenges associated with a restriction, particularly in the context of the green transition and the role PFAS play in a wide range of crucial industries. As Research and Technology Organizations (RTOs), we are in a unique position to accompany the legislative process: by assessing the environmental risks of exposure, researching material substitutes and developing sustainable solutions. While we do advocate for PFAS restrictions, we emphasize the need for a nuanced risk assessment that also takes into consideration that in some industrial production processes suitable substitutes do not yet exist. We recommend strategic investments into substitutes, closed-loop methodologies and a systematic assessment of the feasibility of interventions. We support a balanced approach that integrates the responsibility of the industry, regulatory support and the urgent need for independent research to obtain sustainable alternatives, thus ensuring both, the twin transition and the considerate phase-out of PFAS to protect society in the short and the long term.

### Our positions in summary

- **We welcome a restriction on PFAS** because the environmental and toxicological hazards posed by many PFAS are undisputed. Restrictions need to be assessed and implemented in a differentiated approach that considers the hazards, the availability and the (economic) viability of substitutions in the respective use cases. Well-considered restrictions will stimulate research and development on alternatives and, if well implemented, can thereby provide EU-based companies with competitive edge.
- **Indiscriminate restrictions of PFAS** compounds **without mitigating measures** and available **substitutes threaten to disrupt a green transition**, European industrial competitiveness and European technological sovereignty. In a wide range of industrial use cases substitutes for PFAS can be identified. However, there are still essential use cases for PFAS for which a viable alternative does not yet exist on a commercial scale.
- **Europe's RTOs stand ready to support regulators** with independent advice or verification. We emphasize the urgent **need for the research and development** of alternative materials, processes and products.
- **Innovation must be facilitated and accelerated** through **consistent policies, appropriate regulation** and other (financial) mechanisms that provide incentives for the fast development of suitable alternatives.
- In cases where viable alternatives do not yet exist, **the industry must provide evidence** prior to any regulatory exception that no risks are associated with the production, use and recycling of PFAS materials.

## Background

Per- and polyfluoroalkyl substances (PFAS) represent a versatile class of synthetic chemicals that have been extensively employed in diverse industrial and consumer applications for several decades. Their distinctive attributes, encompassing water and oil repellence, heat resistance and chemical robustness make them highly attractive in a range of products, from non-stick cookware, paints and packaging to firefighting foams. PFAS also play a crucial role in key transformation industries. The unique properties resulting from their strong chemical bonds enable high-tech processes and products in energy technology, semiconductor technology, medical engineering, photonics and more. They form biocompatible coatings on medical devices, improve efficiency and durability of chemically exposed components in energy infrastructure and have various applications in the production of semiconductors and in semiconductors themselves.

However, it is these same properties that lead to adverse effects on environmental and human health. PFAS are highly mobile and accumulate in drinking water, soil, food and organisms far from their source — in the meantime, oceans worldwide have become significant reservoirs for PFAS. Certain PFAS can be toxic to reproduction and fetal development, can cause cancer and are suspected to interfere with the human endocrine system. PFAS enter the environment through various sources, including industrial facilities, consumer products such as cosmetics and clothing, and food contact materials. Cleaning up polluted sites requires significant resources.

In 2019, the EU Council of Ministers called for an action plan to eliminate non-essential uses of PFAS. In January 2023, Germany, the Netherlands, Denmark, Norway and Sweden submitted a proposal based on the REACH Regulation (registration, evaluation, authorisation and restriction of chemicals). The proposal seeks to restrict the production, use, sale and import of PFAS in the European Economic Area. Consultation from the European Chemicals Agency (ECHA) ended in September 2023. Once ECHA's scientific Committee for Risk Assessment (RAC) and Committee for Socio-Economic Analysis (SEAC) have evaluated the proposal and developed their opinions, they will submit their opinions to the European Commission. The Commission will then formulate a proposal for consultation and decision among EU Member States, which will likely be reached in 2025. The restriction will commence 18 months after a final decision has been reached.

## The view of European Research and Technology Organizations (RTOs) on PFAS

RTOs play a key role in strengthening the competitiveness of European industry in global markets for future technologies. As enablers, solution providers and intermediaries between academia and industry, we facilitate collaboration across disciplines and sectors, act as test beds and contribute to the development of materials and chemicals. In doing so, we also provide decision support and education to accelerate compliance, support industry adaptation and enable participation in regulatory frameworks. For this reason, our role is also to assess the environmental impacts of PFAS, develop detection analytics and drive research into suitable substitutes and recycling technologies. Despite our present reliance on PFAS in various research fields, such as medical engineering, renewable energies, photonics and the semiconductor industry, we continue to aim for sustainable solutions that are in line with regulations and broader societal and environmental goals.

## Our positions in focus

### We welcome a restriction

The toxicological effects of many PFAS compounds on people and the environment have been indisputably proven. **This is why we generally welcome a restriction on such compounds.** Simultaneously, we emphasize that the likelihood of exposure depends on the specific context (e.g., encapsulated in the product vs. external coating) and the type of PFAS. Therefore, **we recommend a differentiated risk assessment and corresponding restrictions** for individual PFAS groups and use cases.

### Mitigating measures are necessary

Currently, no substitutes are commercially available with comparable material properties for several processes and products that use PFAS. It is unlikely that appropriate substitutes for a complete replacement of PFAS will be developed, tested and approved in the short-to-medium term. Therefore, **a far-reaching and hasty restriction without mitigating measures would have consequences for Europe's economic competitiveness**; it would affect the green transition of regional-to-European economic and innovation systems as well as science and research in green technologies. A restriction particularly affects high-tech sectors, such as medical engineering, the semiconductor industry, photonics and renewable energy technologies. Compensatory options are needed to ensure the competitiveness of European research and industries (see "deep dives"). Therefore, we support measures that allow industries to implement a gradual phase-out of PFAS.

### Close collaboration between science, politics and industry is crucial

We deem it the **responsibility of industrial associations and companies to demonstrate upfront that their usage of PFAS is not associated with toxicological risks** and that there are no comparable/suitable substitutes available at this moment. At the same time, we express our willingness to provide crucial support to regulatory authorities through independent and scientifically grounded assessments and reviews. In this spirit, **we emphasize the urgent need for the research and development** of comparable and more sustainable and environmentally friendly alternatives to PFAS. This **requires political intervention** (like the proposed restriction) to stimulate development and innovation, as these advancements may not materialize organically. Such political impetus is essential at both the national and European levels, supported by an **appropriate regulatory framework and incentives**, encompassing various mechanisms that stretch beyond financial considerations.

## Our recommendations

### Foster research and the development of alternatives

**We support a restriction and recommend targeted measures to support and expedite research** and development as well as to systematically evaluate the feasibility of alternative materials and approaches.

**Strategic focus should be placed on**:

- **Substitution material research**: Investments should be made in comprehensive research on alternative materials to replace PFAS. These substitutes should maintain the quality of end products and industrial processes and fulfil ecotoxicological standards/requirements in line with the EU chemicals strategy for sustainability and the safe and sustainable by design (SSbD) framework.
- **Demand reduction:** In parallel with substitution research, options should be explored to reduce demand for PFAS functionality. This may include reducing performance overengineering or new business models to (fairly) distribute increased maintenance costs of lower-lifetime materials.
- **Closed-loop approaches**: Closed-loop technologies in both manufacturing and processing of PFAS, as well as in the disposal of PFAS-containing products, should only be developed and adopted where substitution and demand-reduction are not yet sufficient. This serves as a short-term solution to minimize environmental impacts until the phase-out of PFAS is complete. Analytical methods and instrumentation to assess PFAS containment in products or manufacturing effluents are still limited. Research and development on PFAS measurement is also required to support the regulation.

### Incentivize PFAS-free leading industries in Europe

Moreover, to stimulate industrial innovation, the European Union should facilitate the emergence of new leading industries capable of providing competitive fluorine-free solutions for global markets. **Key recommendations for achieving this include:**

- **Substitution principle**: A substitution principle should be embedded in EU legislation that mandates the use of alternatives when available and guided by the "Best Available Technology" or "Essential Use" principles.
- **Support**: Regulatory conditions should be created to help companies gain a competitive advantage with PFAS alternatives, fostering close collaboration with Research and Technology Organizations (RTOs).

## Deep-dives: hydrogen, microelectronics, medical technology

### Hydrogen

The defossilization of our society will only succeed with the widespread use of green hydrogen as a feedstock and/or energy carrier (HySpeedInnovation, 2020). PFAS are currently used throughout the hydrogen chain (DOE, 2022). They are an essential component of the membrane for all proton exchange membrane (PEM) technologies — from electrolysis to fuel cells. Fluoropolymers are also used as sealing materials, lubricants and much more along the hydrogen chain (Hydrogen Europe, 2023). There are potential technological alternatives for most uses. However, some of them, especially those developed for PEM membranes, are at an early research stage and it is hard to know for sure when the alternative materials will be commercially available. Candidate solutions have a wide range of thermal, mechanical and chemical properties but it is still uncertain whether these special characteristics will be in demand for all use cases. Restricting PFAS will drive the development and expansion of (technological or requirement-based) alternatives. However, even with this acceleration and intensification of R&D, alternatives will need time to reach production at scale. Until suitable alternatives are available at scale, the exposure and disposal of PFAS in the environment should be limited by strictly enforcing existing recycling solutions as well as containment solutions in the production process.

### Microelectronics

As a cornerstone of the European Digital Compass and a strategic industry for European sovereignty at the core of the twin digital and green transitions, the semiconductor industry relies on PFAS that have allowed important technological developments. At this time, semiconductors critically need PFAS at multiple points and for multiple use-cases in the supply chain: production processes, equipment components and the semiconductor products themselves. One challenge is the complexity of the highly integrated supply chain with thousands of steps. The experience with the substitution of PFOS* in the semiconductor industry has highlighted the specific efforts and challenges such as the multiplicity of use-cases and the potential impact on resource consumption as well as the time span (which can be more than 25 years) necessary for the introduction of chemical alternatives (Rina Report, 2022). In this context, the contribution of RTOs, the use of technological research infrastructures and collaborative research and industry alignment are fundamental (OECD, 2022).

### Medical technology

In medical technology, fluoropolymers such as PTFE, PFA, PVDF, FEP, ETFE, ECTFE and fluoroelastomers (FKM, FPM) are used extensively in both diagnostic and therapeutic procedures. The fundamental properties of these high-performance materials in medical applications include their durability and chemical and thermal inertness, their sliding and electrically insulating properties as well as their biostability and biocompatibility. The use of these materials in medical technology is correspondingly broad. They range from implants, catheters and tubes to endoscopy devices and minimally invasive surgery, heart-lung machines, dialysis machines and imaging procedures such as ultrasound, computer tomography and magnetic resonance imaging. The materials frequently come into contact with the human body and body fluids. Consequently, the material requirements for possible fluorine-free substitutes are particularly high in terms of compatibility, stability and non-toxicity, not least from a regulatory point of view and in view of complex authorization procedures, particularly for in vivo diagnostics. In addition to ensuring functionality and processability, a further challenge for the development of possible alternative materials will be to resolve the supposed contradiction between desired stability and durability on the one hand and undesired persistence of the materials after the end of their use on the other. Research and development still have a long way to go here.

* Perfluorooctane sulfonic acid – a specific compound within the PFAS family

**The signatories are European Research and Technology Organizations (RTOs)** that conduct scientific research on future technologies and undertake activities to promote technology and innovation in various fields. They collaborate with industry, academia and government to solve complex problems, transfer scientific results into industry and society as well as to develop new products, processes or services. The RTOs play a crucial role in the European innovation system.

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