

POSITION PAPER

Potential EU nomination of D4, D5 and D6 to the UN Stockholm Convention on POPs

Brussels, 13 July 2023

Introduction

The European Commission and the European Chemicals Agency (ECHA) are currently in the process of proposing to list Octamethylcyclotetrasiloxane (D4), Decamethylcyclopentasiloxane (D5) and Dodecamethylcyclohexasiloxane (D6) in Annex B to the Stockholm Convention on Persistent Organic Pollutants. A public consultation has been launched on 15 June 2023, to gather comments on a summary paper on substance characteristics (persistence, bioaccumulation, long-range environmental transport, and adverse effects) against the requirements and screening criteria of Annex D in the Stockholm Convention on Persistent Organic Pollutants (POPs).

While the European Semiconductor Industry Association (ESIA) is not in a position to provide detailed comments on the substance characteristics, we would like to highlight that the addition of D4/D5/D6 may pose a potentially disproportionate regulatory risk to safe industrial uses of these substances, as the semiconductor industry relies on chemicals to innovate and has strict controls in place to minimize potential exposure to workers and the environment.

Examples of uses include the following:

Front-end: Use of D4 as a precursor material

D4 is an important precursor material used in low quantities for a critical step in the semiconductor manufacturing process (dielectric layers deposited via chemical vapour deposition in advanced technology). The semiconductor industry has an annual consumption of less than approximately 10 tons.

The manufacturing process for semiconductors ("chips") takes place under strictly controlled conditions in a clean room. **There is no exposure to employees and the environment:**

- D4 is chemically converted in the plasma process; subsequent specialized thermal oxidizer removes any unreacted OMCTS in the process ($\approx 99\%$);
- No wastewater is generated;
- D4 does not remain, even in trace amounts, in the subsequent chip;
- Like all semiconductor manufacturing processes, the deposition process takes place in a special process chamber within an automated and closed tool in a clean room.

Back-end: D4/D5/D6 as part of adhesives, encapsulants and thermal interfaces

Silicone polymer-based materials containing residuals of D4/D5/D6 are used as adhesive, encapsulant and thermal interface materials in the semiconductor component assembly process, where process-controlled conditions are in place to ensure the electrical performances required from the final component. The silicone polymer-based materials remain embedded in the semiconductor component, therefore **there is no emission to the environment during the use phase of the component.**

Manufacturing equipment: silicone polymers depend on D4/D5/D6 monomers

D4/D5/D6 are used as monomers 99% of which is consumed in the reaction of silicone polymer manufacturing. These polymers are used in tools and infrastructure equipment applications which are also important for the semiconductor manufacturing. There is no environmental release from use of silicon polymers in the semiconductor industry. In consequence, **D4/D5/D6 is safe to use in semiconductor manufacturing.**

Under the EU REACH restriction processes, as of June 2023, D4/D5/D6 are proposed to be restricted with a proposed exclusion of industrial manufacture of articles, a risk measurement measure that ESIA fully supports, as it provides the semiconductor industry the legal certainty to continue our safe industrial use.

As the Stockholm Convention on Persistent Organic Pollutants listing process is generally designed to eliminate chemicals, the nomination alone, even to Annex B, will cause tremendous uncertainty and disproportionate disruption, in the semiconductor industry and our supply chain.

Conclusion

ESIA would ask Member States and the EU commission to carefully consider the proportionality of such a regulatory risk management approach to the substance and to take the necessary time to review all scientific assessments, evidence, and consequences for strategic EU industries, such as the semiconductor industry prior to any decision on a proposal for an EU nomination of D4/D5/D6 under the Stockholm convention. ESIA believes that the proposed listing nomination is not the appropriate or proportionate way to address D4/D5/D6 and would encourage the Commission and the Member States not to support such an approach.

For further information:

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ABOUT ESIA

The European Semiconductor Industry Association (ESIA) is the voice of the semiconductor industry in Europe. Its mission is to represent and promote the common interests of the Europe-based semiconductor industry towards the European institutions and stakeholders in order to ensure a sustainable business environment and foster its global competitiveness. As a provider of key enabling technologies, the industry creates innovative solutions for industrial development, contributing to economic growth and responding to major societal challenges. Being ranked as the most R&D-intensive sector by the European Commission, the European semiconductor ecosystem supports approx. 200.000 jobs directly and up to 1.000.000 induced jobs in systems, applications and services in Europe. Overall, micro- and nano-electronics enable the generation of at least 10% of GDP in Europe and the world.