science summary

Environment Agency

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Science Project: Environmental Risk Evaluation Report: Octamethylcyclotetrasiloxane

Summary

The Environment Agency and collaborators have evaluated the environmental risk of octamethylcyclotetrasiloxane, also known as D4. Under our chemical prioritisation system, D4 is one of a group of related cyclic siloxanes identified as a high priority for the evaluation of risks to the environment.

The evaluation follows closely the methods outlined in the European Union (EU) Technical Guidance Document (TGD) for the risk assessment of new and existing chemicals. The producers and users of D4 provided some of the information used in the report on a voluntary basis and their helpful assistance is formally acknowledged. The evaluation has also been through a national and international peer review process.

The main uses of D4 are as an intermediate in the production of other chemicals (silicone polymers and synthetic amorphous silica), as a component in some personal care products (such as cosmetic products and skin- and hair-care products), and in some household cleaning products. Use as an intermediate to make silicone polymers effectively consumes the D4, although trace amounts still remain in the final products and can be subsequently released to the environment during polymer use. D4 in personal care and household products results in widespread environmental exposure.

The persistent, bioaccumulative, and toxic (PBT) status of D4 is assess using the available measured and calculated data. The overall conclusion for the PBT assessment is that, on the basis of the results from a poorly reported preliminary study, D4 potentially meets the criteria for a PBT substance when the persistence in sediment is considered. However, experimental and modelling work is on-going to evaluate its persistence in sediment, and so the PBT assessment should be revisited once this work is completed. Also, the amount of D4 that ultimately reaches the sediment compartment is likely to be limited by both the high rate of volatilisation from surface water and the reasonably rapid rate of hydrolysis in surface water.

Standard models are applied to the information available to assess the risks from the normal use of D4 to water, sediments, soil, and predators. The property data set is reasonably complete, but in some areas further information could be valuable. This assessment therefore makes recommendations about the significance of the data gaps and/or uncertainties, and suggests where further research should be focussed.

Estimates of potential emissions to the environment from the key life-cycle stages are based on industry research, Emission Scenario Documents, and (in the absence of any other information) worst-case default assumptions. Monitoring data are also available for some life-cycle stages and are taken into account in the assessment where relevant. Using the available information, risk characterisation ratios above one which indicate an unacceptable risk for the environment, arre identified for certain life-cycle stages. The most significant of these is the production and on-site use as an intermediate (in the UK). It therefore has the highest priority for further work. In addition, uncertainties in the assessment for predators in general should be addressed. The risks to humans exposed via the environment are also assessed. The resulting margins of safety are large enough to conclude that there are no concerns for local or regional exposure.

The main findings of the risk evaluation are:

1. No risks are identified for the air, water, sediment, and terrestrial compartments, and nor for predators, from the off-site use as an intermediate (both wet and dry processes), formulation and use in personal care products, formulation and use in household products, and regional sources of D4. There are also no risks for humans exposed via the environment.

2. Possible risks are identified from production and on-site use as an intermediate. These relate to the UK production site, and apply to fresh water, freshwater sediment, predators, marine waters, marine sediments and predators, and top predators. These conclusions are based on the limited information available, and hence there is significant uncertainty in the conclusions. The receiving fresh water, which is subject to local Environment Agency regulation, is a relatively non-standard environment, and dilution into the sea is possibly higher than the default value used.

3. Further information required to reduce these uncertainties should include clarification of the emissions from the production site in the UK. This could be statistically analysed site-specific data on emissions, in compliance with the TGD (e.g. further effluent monitoring or monitoring of the receiving water).

4. Uncertainties in the assessment for predators relate to both the BMFs and the predicted no-effect concentrations (PNECs) used.

   Subject to further information on these uncertainties, more testing may be required to revise the predicted effect concentrations (PECs), such as long-term toxicity testS with *Lumbriculus variegatus Hyalella azteca* (or similar) using spiked sediment.
   Any further sediment toxicity testing should take account of the recommendation in the TGD that such tests be carried out without supplemental feeding.

   however, for the scenario for production and on-site use as an intermediate, revision of the PNEC for sediment alone is unlikely to result in a risk characterisation ratio <1 without further information to refine the PEC for sediment.

Industry is currently undertaking a voluntary test program to address some of the uncertainties in this assessment.

This Summary relates to information from the following science reports:

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