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FRAUNHOFER UMSICHT TAKES POSITION
TOPIC: MICROPLASTICS

A POSITION PAPER OF THE SERIES »UMSICHT TAKES POSITION«

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FRAUNHOFER UMSICHT TAKES POSITION
OUR POSITION PAPERS

Within the series of position papers »Fraunhofer UMSICHT takes position« we cover issues which currently attract the attention of society, science and economy. In addition to our research activities, we would like to take a position and make a contribution towards greater objectivity in emotional debates. At the same time we would like to show whether and how we can help to solve societal challenges.

Our statements are developed within the staff of Fraunhofer UMSICHT. Each position paper is the result of an opinion-forming process throughout the institute; in this case driven by the Working Group Microplastics which was supported by the Sustainability Group. In controversial issues, the staff of our institute often displays the diversity of opinions within the society. We openly present the variety of opinions in our position papers if we cannot come to one single position concerning the subject in question.

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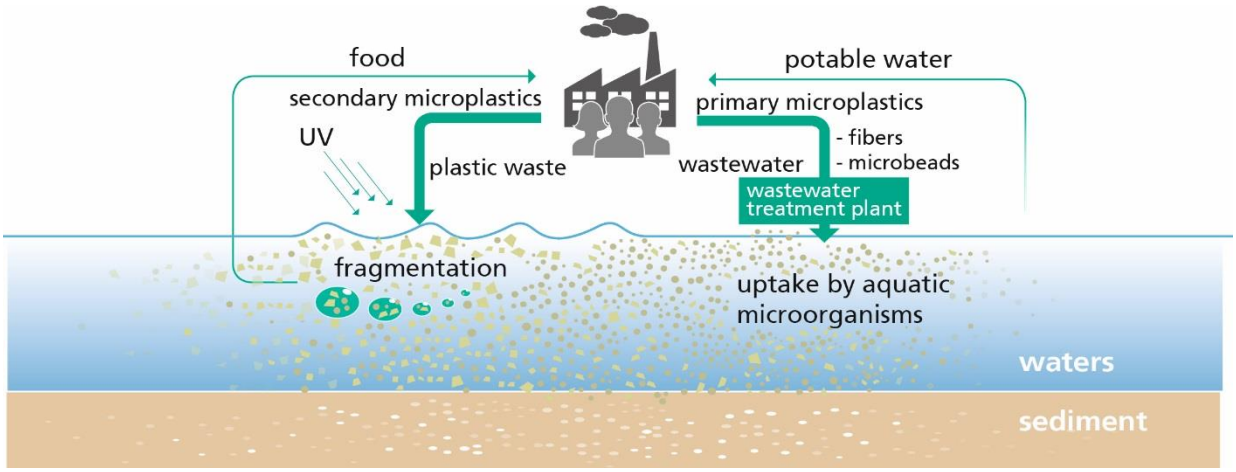
FRAUNHOFER UMSICHT TAKES POSITION:
TOPIC MICROPLASTIC POLLUTION



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Position of the Fraunhofer UMSICHT on the problem of microplastics

Background

Headlines like »Microplastics overburden wastewater treatment plants« [Spiegel-2014], »Plastic particles found in food« [NDR-2014], »Tiny plastic particles contaminate drinking water« [Welt-2013] show that the discussion about microplastics pollution is becoming increasingly important in the public debate. A definition of microplastics is given in the box at the end of this position paper. There is a strong need for scientific research on this topic in order to avoid possible misleading conclusions based on speculations and unproven assumptions due to the lack of information and knowledge.

In the opinion of Fraunhofer UMSICHT it is imperative to intensify the scientific research on the issue of microplastics. The growing amount of microplastics in the aquatic environment due to increasing plastic production and unregulated disposal can turn into a serious problem for mankind and nature. This issue requires an early development of sustainable solutions.

It is scientifically proven that microplastics get into the natural water cycle and thus also partly into the food chain. The importance of various sources of microplastics is judged differently. The quantities and qualities of plastics and microplastics in the water cycle have not been quantified or sufficiently investigated yet. The development pathways of microplastics and the long-term impacts on the environment, humans and animals remain largely unexplored as well.

In addition, the impact of physical and chemical factors on the fragmentation of plastics in aquatic compartments has not been investigated very much until now. The same applies for the discharge and uptake of the contaminants by plastics and their impact on biological organisms.

The scientific findings on microplastics known and published until now vary widely and partly contradict each other. In our opinion, this fact can be explained by the incomplete knowledge base on microplastics and their hazard potential for the environment. Inconsistent methods and

lack of standards in sampling, processing and assessment of microplastics impede the comparability of the data.

In our opinion, several independent detailed studies on microplastics must be carried out in order to provide reliable scientific results for comparisons and impact assessments. As a starting point, the studies should concentrate on investigating microplastics in fresh and salt waters as well as in drinking water to provide the volume of microplastic waste and to reveal the extent of the problem. These studies should not only focus on individual systems, such as rivers and seas, but have to regard the whole system. The latter includes industry, households, sewers, sewage treatment plants, discharge structures, receiving waters, limnic and marine waters as well as shore-based pathways for plastics, e.g. landfill sites or manufacturing companies.

In addition to reducing microplastics discharge and developing methods for the removal of already discharged microplastics and plastics from the environment; in the future there will be a need to develop the new materials, for which biodegradability in different environments and the absence of pollutants (e.g. plastic additives) are ensured.

The debates in German media focusing on industrially generated microplastics for cosmetics and hygiene products (e.g. microbeads) do not tackle to the whole extent of the worldwide problem. This is shown by Germany's relatively low annual amounts of manufactured plastics (approximately 500 tons) and by the voluntary commitment of many German cosmetics manufacturers not to use microbeads. However, the annual worldwide production of plastics accounts for about 300 million tonnes, according to Plastics Europe. The United Nations Environment Programme (UNEP) claims that there are an estimated 100 million tonnes of plastic waste in the oceans by now and 6 million tons are added annually. In consideration of these quantities, it is obvious that fragments of plastic waste will play a much larger role than microbeads in the future. This is the reason why the future research on microplastics should focus on fragments of plastic waste.

Microplastics accumulate in aquatic systems and cannot be removed by any currently available technology on the market. Thus, we regard research, development and application of technologies that concentrate on removing plastic particles from seas and oceans as important for the first transitional period. In the medium and long term, we favour the use of more effective recycling and disposal concepts for plastics in order to avoid microplastics discharge directly at the source. We strongly advocate the development and application of technical procedures with which microplastics can be retained before they enter into limnic and marine systems.

From the perspective of Fraunhofer UMSICHT, the necessary steps include:

1. Avoidance of plastic discharge into ecosystems through global expansion of suitable monitoring and collection systems and logistical optimization in handling and transportation of plastic products.
2. Development of bio-based materials that degrade in the environment compartments cascade- like in reasonable periods (e.g. for cosmetics and cleaning products or packaging).
3. Development of technical methods to reduce microplastics discharge, e.g. by applying filtration techniques on the pollution sources (sewage treatment plants, washing machines etc.).
4. Standardization of assessment methods.
5. Exchange of information between scientific communities, industry and public.
6. Raising the awareness and changing the consumer behavior with regard to plastics - through scientifically sound and understandable communication on the topic.
7. Providing incentives to reduce the plastic discharging and furthermore to actively remove the plastics from the environment, e.g. by expanding polymer harvest systems for fishing industries and fishing fleets in rivers and seas or by executing waste plastic collection campaigns.

Infobox Definition Mikroplastik

The American National Oceanic and Atmospheric Administration (NOAA) together with the international and scientific consensus define microplastics as »plastic particles up to 5 mm in diameter«4. A basic distinction is made between primary and secondary microplastics [NOAA-2013].

Primary microplastics are industrially produced plastic moldings (i.e. microbeads), which can be found e.g. in hygiene articles such as shower gels or peelings. Other kind of primary microplastics are the so called »resin pellets« - cylindrical plastic granulates which are used as raw material for the manufacturing of plastic products. These pellets are frequently transported by large container ships and can get into the water cycle during transhipment, through accidents or illegal disposal.

Secondary microplastics include plastic fragments and microplastic fibers. The fragments are formed in waters and on land by mechanical processing or by exposure of larger plastic parts - such as packaging, plastic bags or utensils made of plastic - to the radiation. The microfibers emerge from synthetic clothing, dissolve during washing and are emitted into the water cycle with the water discharge from the washing machine.

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