

Microplastic – Invisible Danger – Development of functionalized hybrid silica gels

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In the environment the issue of the introduction of microplastic is becoming more and more problematic. In the cosmetic- and body care sector plastic beads are for instance increasingly added to achieve better cleaning effects. Microplastic is defined as a particle or fibre with a diameter smaller than 5 mm [Moore 2006]. Hereby, micro indicates the classification in proportions and plastic the type of material. There are two different scales which are referred to as L-MPP (Large Microplastic Particle) between 1-5 mm and as S-MPP (Small Microplastic Particle) smaller than 1 mm. These beads cannot be held back significantly by sewage-works. Therefore, the so-called „Microbeads“ directly enter the sea after a single use [Lesslie 2013].

Especially microorganisms are affected because of the increasing impact of minute plastic particles in marine- or surface water. It is known of more than 250 organisms that these confuse microplastic with food and thus ingest it as such [Alsopp 2005]. This leads to an accumulation in the organism that results in an enrichment in the food chain which ends with humans.

At present, microplastic particles are removed from the sewage by means of membrane filter technology. In this respect it was found out that based on 3387 particles/L nevertheless still 148 particles/L pass the sewage and enter the marine- or surface- and flow waters [Mintenig 2014]. This corresponds with a reduction of 96%. This, however, involves great costs and therefore a favorable alternative solution should be found. In the team of Ecological and Organic Chemistry of the University Koblenz-Landau a possibility to sustainably remove microplastic from the aquatic medium by means of functionalized hybrid silica gels is already being investigated intensively. In 2005, Moreau et. al. managed to synthesize a hybrid silica gel with a high surface structure [Moreau 2005]. These findings concerning the materials serve as a basis for further research.

In a multi-stage synthesis materials are produced that bear chemical information containing a polymer inclusion compound which captures microplastic particles. Subsequently, the inclusion component can be detached by the use of special filters and can be transferred in a recycling process.

References:

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