

MICROPLASTIC PARTICLES AT DIFFERENT STAGES OF WASTEWATER TREATMENT PLANT: CHARACTERIZATION AND REMOVAL

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In recent years, plastic has become one of the most widely used materials. In 2018 global plastic production reached 359 million tons, in 2019 - 368 million tons [1]. In 2020, the amount of plastic waste significantly increased due to COVID-19 pandemic (approximately 3.4 billion single-use facemasks or face shields are discarded every day) [2]. Plastic pollution is described as one of the most pressing environmental issues.

Plastics can be described as a synthetic or semi-synthetic high molecular weight polymers that are typically obtained by polymerization of monomers. Microplastics (MPs) are particles with a size less than 5 mm and are divided into two main types according to their origin. Primary microplastics are small particles produced for commercial use. Mostly they are found in household products such as: cosmetics, personal care products, cleaners, detergents. Due to chemical, biological and mechanic processes, the larger plastic breaks down into small fragments. This type of microplastic particles is identified as secondary [3].

Research on microplastic effects to human health and aquatic ecosystem are still limited and not fully investigated. However, the newest research represents the negative impact of microplastic particles on the marine and freshwater ecosystem. The extremely small size of MPs allows it to be swallowed by aquatic organisms. In this way, the microplastic can enter the food chain and accumulate in higher-level organisms [4]. In addition, plastic contains wide range of additives (stabilizers, antistatic agents, flame retardants, biocides). When the additives are not chemically bonded to the polymer molecules, they can be easily released from the plastics and cause toxic, carcinogenic or endocrine disrupting properties. Furthermore, microplastics serve as carriers of toxic chemicals, such as heavy metals, and microbial pathogens in the environment [5].

There are many pathways by which microplastic particles from our daily life can be released into the environment. Although wastewater treatment plants (WWTP) demonstrate a high efficiency in removing various sizes organic and

inorganic materials, microplastic particles are so tiny (0,02 -0,5 mm in size) that there is a big challenge to remove them. As a result, part of the microplastics is transferred from wastewater to the marine and ocean circulation system.

This work presents the determination and characterization of microplastics in WWTP. Results review the abundance of microplastic particles in size range from 10 µm to 1000 µm, they characteristics as well as removal efficiency at different stages of wastewater treatment plant.

Research on microplastic properties in wastewater treatment plant could be the first step in improving our environment and finding new innovative methods.

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