
Impact of the concentration and type of microplastics on the treatment efficiency and biomass structure in aerobic granular sludge reactors

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Abstract

Microplastic (MP) is one of the most common micropollutants in wastewater. MP can affect the metabolism of microorganisms in sewage treatment plants and transport and release other micropollutants such as antibiotics, heavy metals, or bisphenol A. MP is re-introduced into the environment with the treated wastewater, posing a threat to the environment and human health. Aerobic granular sludge (AGS), which shows high biological activity and resistance to toxic compounds, is a promising technology of biological treatment of wastewater with a high content of MP. In the study, an effect of the type and concentration of MP (polyethylene terephthalate - PET, polyethylene - PE) will be assessed on the treatment efficiency and morphology, species structure, and activity of AGS. The study will verify the following research hypotheses:

hypothesis 1 - the use of AGS enables effective MP removal from wastewater and reduction of MP transmission to the aquatic environment,

hypothesis 2 - the type and concentration of MP in wastewater affects the morphology and production of extracellular polymers in AGS,

hypothesis 3 - the type and concentration of MP in wastewater affects the species structure of microorganisms in AGS,

hypothesis 4 - the type and concentration of MP in wastewater affects the metabolism of microorganisms involved in nutrient removal.

The interdisciplinary combination of technological and molecular research will expand the knowledge about the effect of MP on treatment efficiency, and microbial communities in AGS-based wastewater treatment processes.

Keywords: Microplastic, wastewater, aerobic granular sludge, microorganism

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