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Dissertation Fact Sheet

Bacteria and Extracellular Polymeric Substances in Activated Sludge Scum Formation



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The formation of thick viscous scum layers is a persistent problem in wastewater treatment plants (WWTPs) observed all over the world. Three factors are necessary for scum formation: (i) dispersed gas bubbles, (ii) surface-active material and (iii) hydrophobic compounds. For instance, air bubbles in the aeration tank initialize scum development. The gas-water interface is stabilized by the adsorption of surface-active molecules. The presence of hydrophobic material provides stable adhesion to solid particles promoting persistent scum layers. Surface-active substances and hydrophobic material may enter the WWTP via primary effluent or be produced by various bacteria in the presence of hydrophobic carbon sources and under nutrient deficiency.

One objective of this study was to characterize the relevant bacteria (e. g. *Microthrix parvicella* see Fig. 1) that are involved in scum formation. The identification of these bacteria was performed by classical microscopic sludge analysis and molecular biological methods to obtain information about their taxonomic affiliation. The knowledge about the phylogeny of scum bacteria might reveal physiological properties of these bacteria, which is helpful for the understanding of the scum formation process and the application of specific control measures. A further topic of this study was to

investigate whether scum formation is a passive floating mechanism of activated sludge to the water surface or an active growth process of a specific scum biocenosis close to the water surface. The elucidation of the role of these scum bacteria and extracellular polymeric substances (EPS) in the formation of stable scum layers was the third objective of this work. EPS might perform two different functions in the scum process: (i) they serve as nutrient source and promote the growth of a specific bacterial biocenosis and (ii) they directly stabilize scum layers due to their hydrophobic sites.

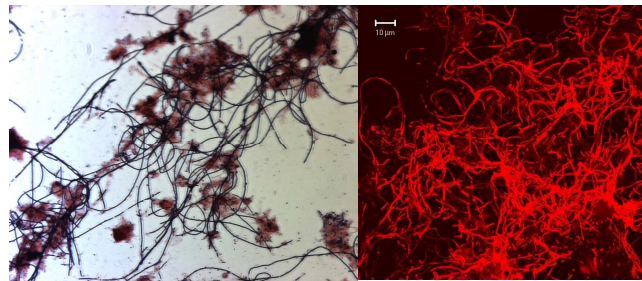


Fig. 1: Scum bacteria *Microthrix parvicella*

References

- Müller, E., Lind, G., Lemmer, H., and Wilderer, P. A. 2005. Population structure and chemical EPS analyses of activated sludge and scum. *Acta hydrochim. hydrobiol.* 33:189-196.
- Müller, E., Schade, M., and Lemmer, H. 2007. Filamentous scum bacteria in activated sludge plants: detection and identification quality by conventional sludge microscopy vs. fluorescence in situ hybridization. *Water Environ. Res.* 79 (11) :2274-2286.