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ACTIVATED SLUDGE FLOC CHARACTERIZATION BY CONFOCAL LASER SCANNING MICROSCOPY

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Abstract

The aim of this work is the study of activated sludge floc samples stained with different dyes and imaged by Confocal Laser Scanning Microscopy (CLSM). Activated sludge flocs were stained for lipids, sugars and esterase enzyme producing bacteria. Images were acquired for different samples to analyze the structural characteristics of the bioaggregates. The analysis of the CLSM images allowed for the localization and estimation of the quantity of different build-up materials. The 3-D reconstructions of dye stained samples show also the spatial distribution of sugars, lipids and esterase producing bacteria. The findings are in concordance with the literature values regarding particle size and concentration. The reflected loose structure of the activated sludge flocs is typical for this type of bioaggregate. As result, we can conclude that confocal microscopy with different staining methods enables a deeper analysis of the structural characteristics of activated sludge flocs. By allowing for a detailed insight in the activated floc's structure, this novel method may be a step towards a better understanding of the processes involved in this technological application, and might help the development of more comprehensive mathematical models of the complex transport processes and reactions occurring in the biological wastewater treatment.

Key words: activated sludge floc, confocal microscopy, EPS, staining, three-dimensional reconstruction

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