

PS 1.19**Biopolymer monitoring using quantitative image analysis techniques**

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Polyhydroxyalkanoates (PHAs) are intracellular biopolymers with many applications, particularly as substitutes of polypropylene and polyethylene, due to their thermoplastic properties and biocompatible nature. Furthermore, glycogen is a polysaccharide of glucose with high importance in the metabolism of microbial communities and polyphosphate is a microbial storage compound that should be recovered in order to offset the worldwide depletion of phosphorus sources. The determination of these biopolymers by chemical analysis is a laborious task, often involving digestion processes prior to gas and high-performance liquid chromatography, which are time consuming and difficult to apply in industry.

Currently, it is important to develop new, rapid and simple techniques to monitor these polymers. Image analysis is a non-invasive and rapid technique that has the potential to be used to quantify these intracellular polymers quickly, in real-time. Mesquita et al. (2013) showed that it is possible to predict the concentration of glycogen and PHAs by quantitative image analysis, using aniline blue and Nile blue staining, respectively. Polyphosphate can also be predicted by this technique through DAPI staining, which is currently under development. These biopolymers are produced by several different microorganisms, and combining their quantification with fluorescence in situ hybridization (FISH) techniques for microbial identification can enable the determination of organisms that store high quantities of each biopolymer. In this work, an advanced quantitative technique is developed to perform real time monitoring of these three biopolymers in a bioreactor performing biological phosphorus removal. Image analysis of the biopolymers was combined with FISH to determine the storage level of each compound within the different microbial populations. This technique will further enable the assessment of biopolymer levels within microbial communities, which can be applied in the biopolymer production industry.

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