PROMICON

MONITORING PHB PRODUCTION IN *SYNECHOCYSTIS* SP. WITH HYPERSPECTRAL IMAGES

Key message

This innovative study highlights the transformative impact of hyperspectral technologies on optimising PHB production from cyanobacteria. The combination of hyperspectral imaging with advanced analytical techniques offers the potential to **revolutionise the management of wastewater treatment and promote the development of sustainable bioplastics.**

Background

Cyanobacteria possess the ability to accumulate polyhydroxybutyrates (PHB), a valuable material for bioplastic manufacturing. However, achieving optimal PHB production demands precise cultivation conditions and constant monitoring, posing a significant challenge for existing methods.

Objective

This study harnessed cutting-edge hyperspectral imaging technologies to track the growth of cyanobacteria and the production of bioplastics (PHB).

Impact

- The application of hyperspectral technology enabled meticulous monitoring of cyanobacteria populations and PHB production, offering crucial insights for **enhancing wastewater treatment processes and optimising bioplastic yield.**
- The research emphasised the importance of creating specialised sensors capable of adapting to different bioreactor scales affordably. It suggested that the integration of multispectral sensors with customised filtering mechanisms could streamline the process by replacing intricate hyperspectral systems. This simplification would facilitate their **incorporation into bioreactors of varying sizes.**

Results

As a collaborative effort between the research groups of AIMEN and UPC, an innovative measurement approach was devised capable of detecting subtle changes in the spectral reflectance of light emitted by cyanobacteria across different cultivation conditions and cellular stages. Leveraging hyperspectral images, the study successfully differentiated between cyanobacteria species within laboratory and pilot-scale bioreactors.

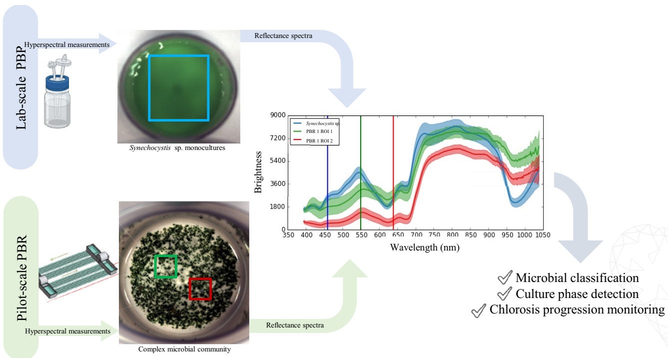

Figure. Comparison between reflectance spectrum of *Synechocystis* sp. from lab-scale PBR and spectra obtained in two different areas from pilot-scale PBR 1. (a) Image of a sample from *Synechocystis* sp. monocultures (top petri dish) and image of a sample from pilot-scale PBR 1 (bottom petri dish). Different selected ROI corresponding to *Synechocystis* sp. monoculture (blue square) and pilot-scale PBR 1 (green and red squares). (b) Mean reflectance spectra for lab-scale PBR containing *Synechocystis* sp. monocultures obtained during the growth phase and the two selected ROI for pilot-scale PBR 1 sample.

Source

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