In-line Raman spectroscopy as PAT for synthetic defined co-culture monitoring

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Project description

In recent years the field of synthetic defined co-cultures (SDCC) has been gaining traction, in part due to society calling for the development of sustainable bioprocesses. Using SDCC cultivations, the productivity of complex biological pathways can be optimized. Through the compartmentalization of reaction subsets, the metabolic burden on microorganisms can be reduced. Additional advantages of SDCC cultivations include limited genetic engineering, the possibility of creating modular bioprocesses, harnessing inter-species signalling to boost productivity, or access to bioprocesses out of reach for singular species cultivations [1-2].

Current advances and applications in the field of SDCC cultivations are hindered by a lack of tools to perform in-depth research and the fact that these cultivations cultures often lack a natural equilibrium [2]. A relatively new technology in biotechnology is in-line Raman spectroscopy. This technology has great potential in overcoming these issues encountered for SDCC cultivations, due to the fact that it can provide accurate continuous measurements of a large variety of compounds essential in bioprocesses, while being non-invasive [3].

The aim of this project is to explore possible applications of in-line Raman spectroscopy to monitor SDCC cultivations. The project will investigate a variety of SDCC cultivation set-ups to investigate the field-wide application of Raman-based monitoring. The first challenge will be to construct accurate data processing models that are capable of distinguishing the SDCC subpopulations, as well as relevant cultivation parameters. Once these models are available, strategies can be developed to control these bioprocesses, with the ultimate goals of obtaining a better understanding of the bioprocesses, as well as improving productivity

References

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