Discovery and engineering of biocatalysts powered by microfluidics

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Intensive growth in biocatalysis requires the application of effective methods for the search and optimization of enzyme variants that meet the requirements of industrial processes. Microfluidics is a technology that offers high analytical throughput, reduced sample and power consumption, and facile process integration and automation. While the potential of microfluidic methods is already well exploited in nucleic acid analysis and screening of large metagenomic and directed evolution libraries, there is still room for broader applications in high-throughput biochemical characterization [1]. This lecture will focus on droplet microfluidics methods and their utilization for the systematic collection of functional data [2,3] as well as recording precise transient kinetic data, providing detailed insight into the mechanisms of enzyme catalysis [4] and protein (un)folding kinetics and stability [5]. The synergy of high-throughput microfluidic data collection, modern numerical methods for global data analysis, and molecular modelling will be provided in the examples [4,5]. The perspective potential of combining automated data collection by microfluidics with machine learning methods will also be discussed [1,6].

References

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