From bench-scale to high throughput platform: Phase diagrams determination and solute partition analysis in aqueous two phase systems

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Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

OP17 - From bench-scale to high throughput platform: Phase diagrams determination and solute partition analysis in aqueous two phase systems

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Sugars derived from lignocellulosic materials are the main raw material in bio-based processes aiming to produce renewable fuels and chemicals. However, inhibition of enzymes by reaction products (cellobiose and glucose) is one of the major drawbacks of enzymatic hydrolysis of lignocellulosic materials. This effect is even more pronounced in hydrolysis containing high solid content (15-20% or higher water-insoluble solids – WIS), which is desired in order to result in higher total reducing sugar concentration in hydrolysates and reduce water usage[1]. Aqueous Two-Phase Systems (ATPSs) are used in a wide range of processes, including analytical applications, product recovery and environmental remediation. In the case of product recovery, ATPS enables an integrated process in which the bioconversion occurs at the same time that the products are being removed from the system. This approach, called extractive bioconversion, contributes the most to reactions in which the products are inhibitors [2]. To the best of our knowledge, ATPS has not been used as an extractive environment to relieve product inhibition in biomass conversion. Although works using high throughput platforms have been largely reported in literature[3] [4] [5] [6] [7], there is a lack of technologies that address high throughput screening for separation of sugars and proteins in aqueous two-phase systems. This paper will present the methodology development and its transference from bench-scale to a high throughput platform for screening and selection of ATPS. Determination of phase diagrams, partition coefficients of enzymes and proteins, enzymatic activities, as well as a strategy designed to optimize the system parameters (pH, temperature and salt concentration) will be shown. Therefore, this automated and miniaturized experimental setup will be used to develop a new process for sugarcane bagasse hydrolysis based on aqueous two-phase system. The purpose of this technique is to remove the product *is situ*, as long as it is produced. As a consequence of product removal, enzymes tend to maintain their maximum activity[8].

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Keywords: Aqueous two-phase systems; high throughput experimentation; product inhibition; separation of sugar and enzymes.

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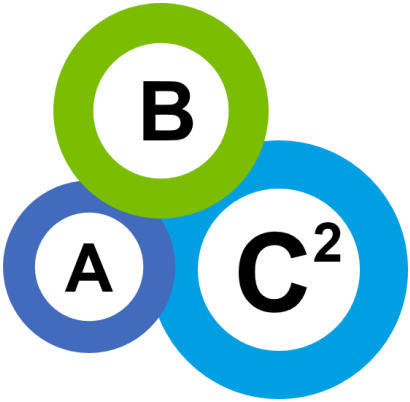

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