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# Thermoreversible aqueous biphasic system as integrated biocatalytic processes

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## PURPOSE OF THE ABSTRACT

Mainly due to their high activity, specificity and selectivity, and possibility of minimizing raw materials consumption and by-products production, industries tend to adopt the use of enzymes in catalytic processes [1]. Despite these advantages, the maintenance of the enzymes structural stability during the biocatalytic step and their reusability are yet critical challenges [1]. Reversible aqueous biphasic systems (ABS) appear however as an interesting alternative since several processing steps can be combined into a single operation. Furthermore, ABS are composed of two immiscible aqueous-rich phases, valuable when dealing with biologically active compounds [2].
In this work it is shown that ABS composed of hydrophilic zwitterions (ZIs) combined aqueous solutions of polymers (PEG) have their reversible behavior triggered by small changes in temperature. Unlike classical liquid-liquid systems, ZI-based ABS allow to work in a wide range of temperatures and compositions which can be tailored to fit the requirements of a given separation process. These features combined with the biocompatible nature of the ABS phase-forming components allow the design of effective ABS to be applied in biocatalytic processes, in which the enzyme-catalyzed reactions occur in the homogenous solution, and after which small changes in temperature induce the two-phase formation and the complete separation of enzymes from the respective products (Figure 1). In this work, this possibility was shown with laccase as the biocatalyst and 2,2?-azinobis(3-ethylbenzthiazoline-6-sulfonate) (ABTS) as the subtract. The reaction was successfully carried out in a homogenous aqueous solution, after which an increase in temperature allowed the two phases creation and the complete separation of the enzyme from the product in one-step. The recovery and reuse of the enzyme and the ABS phase-forming components was also successfully demonstrated, contributing towards the development of sustainable production and separation processes [3]. The results here presented unveil the relevance of IL-based ABS as efficient integrated production-separation processes in biocatalysis.

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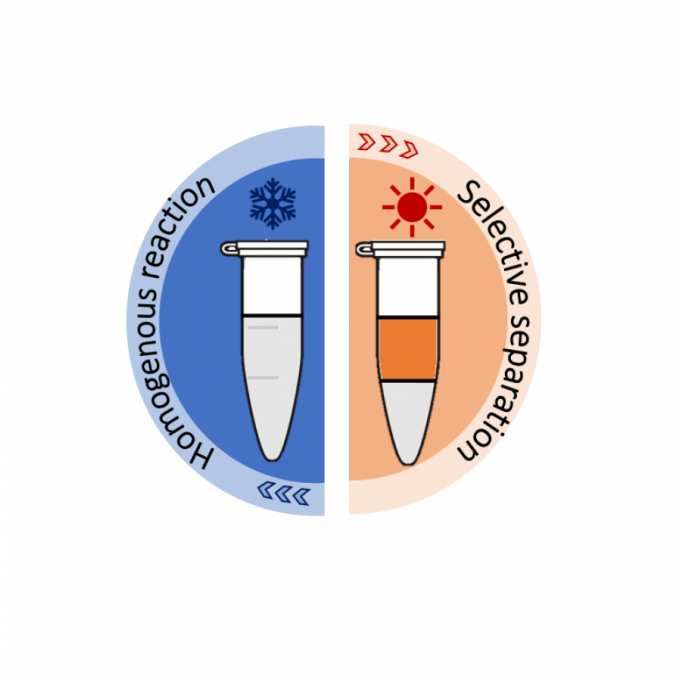
## FIGURES




## FIGURE 1

Figure 1.

Flowchart of the integrated reaction-separation process developed.

## FIGURE 2


## KEYWORDS

aqueous biphasic systems | thermoreversible system | integrated process | biocatalysis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