

Membrane-immobilized transaminase for intensified chiral amine production

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Key words: transaminase, enzyme immobilization, chiral amines

Chiral amines are essential building blocks to manufacture high-value active pharmaceutical ingredients. Their synthesis often involves non-green processes requiring expensive homogeneous catalysts and high-energy inputs^[1]. Hence, amine transaminases (ATAs) have gained considerable attention lately, as their use in transaminations provide greener routes to produce chiral amines with excellent enantioselectivity. Industrial applications of ATAs remain however restricted to batch processes in which ATAs are employed as non-reusable homogenous biocatalysts^[2]. To overcome this limitation, more versatile heterogenized biocatalysts able to operate in continuous flow have been designed^[3]. Importantly, most targeted transaminations are strongly limited by unfavourable thermodynamics. One strategy to shift the equilibrium towards high chiral amine yields is the set-up of integrated reaction-purification processes. In this context, coupling transamination with membrane technology in an enzyme membrane reactor is of particular interest, as it could allow the selective removal of products during operation. Enzymes onto polymeric membranes has already been reported, *e.g.* with lipase or glucose oxidase but not transaminase. As proof of concept, we present the immobilization of an ATA from *Halomonas elongata* (HeWT) onto polyacrylonitrile-based membranes (PAN) and its application to catalyze a model transamination (**Fig.1**). To this end, the PAN surface was chemically modified and then coated with polyethyleneimine (PEI) to host the enzyme. Eventually, glutaraldehyde (GA) was used to cross-link the loosely attached HeWT and thus prevent their leaching from the membrane's surface. The obtained immobilized biocatalyst successfully performed subsequent catalytic cycles and showed negligible HeWT leaching. The decisive parameters impacting the enzyme specific activity were then assessed. As a result, we aim to demonstrate the use of a novel immobilized transaminase support material well-suited for upcoming operations, that pave the way to intensified biocatalytic processes for chiral amines production.

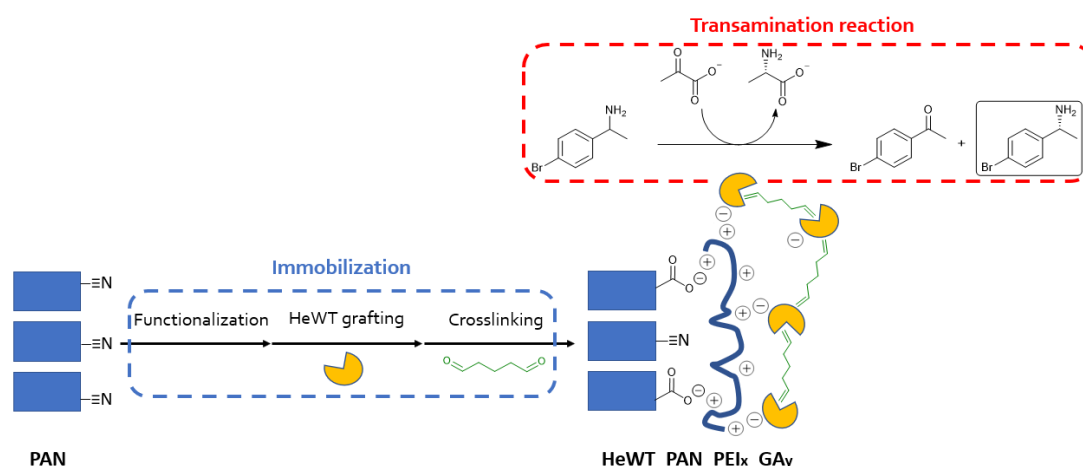


Figure 1. Representation of the HeWT immobilization procedure on PAN membrane and of the batch model kinetic resolution of 4-bromo- α -methylbenzylamine considered herein.

References

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