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Multienzyme coimmobilization on heterofunctional supports

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PURPOSE OF THE ABSTRACT
Multienzyme cascade biotransformations in one pot are gaining momentum since they have demonstrated enhanced catalytic performance than traditional step-by-step transformations requiring sequential pots. Although their evident advantages, the coimmobilization of several enzymes requiring different anchoring chemistries and stability conditions is still challenging. In this work, we exploited a heterofunctional carrier activated with three different chemical functionalities in order to immobilize a wide variety of different enzymes under mild conditions [1]. This support is based on agarose microbeads activated with aldehyde, amino and cobalt moieties thus allowing a fast and irreversible immobilization of enzymes (Figure 1) and in the major cases accompanied by thermal stabilization (up to 21-fold higher than the soluble one). We demonstrated the effectiveness of the described support by coimmobilizing a multienzyme system composed by an alcohol dehydrogenase, a NADH oxidase and a catalase. The confined enzymatic system demonstrates higher performance than the soluble enzyme counterparts achieving a total turnover number (TTN) of 1x10^5 during five batch cycles under operation conditions. Finally, we expand the versatility of the described exploited heterogeneous chemistry to other frequently used immobilization carriers as cellulose microbeads and commercial methacrylate. We envision this solid material as a platform for coimmobilizing multienzyme systems with enhanced properties to catalyze stepwise biotransformations.

FIGURES

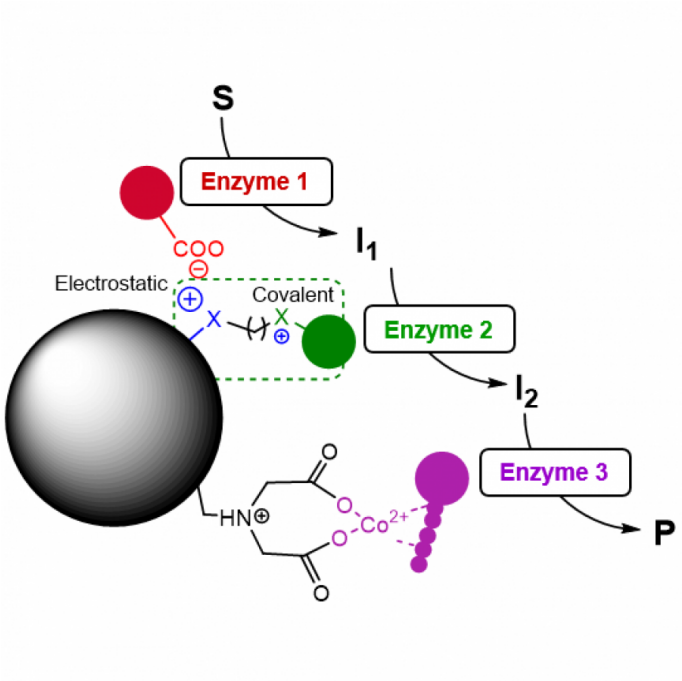

FIGURE 1

Figure 1.

Triheterofunctional support to coimmobilize several enzymes through three different immobilization chemistries

FIGURE 2

KEYWORDS

multienzyme systems | coimmobilization | cascade biotransformations | enzyme stabilization

BIBLIOGRAPHY

Santiago-Arcos, J.; Velasco-Lozano, S.; López-Gallego, F. Multienzyme Coimmobilization on Triheterofunctional Supports. Biomacromolecules 2023, 24 (2), 929-942.