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Promiscuous enzyme catalyzed carbon–phosphorus bond formation

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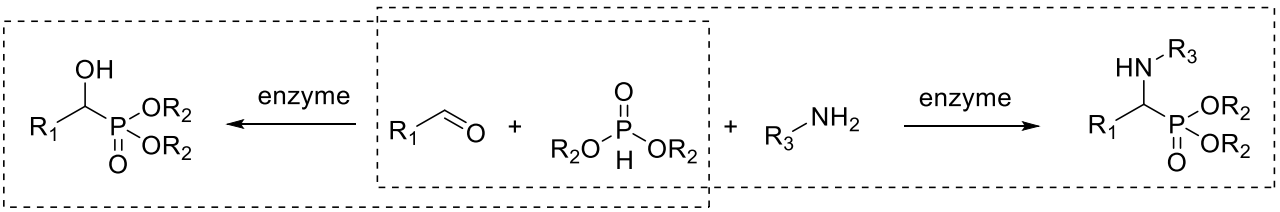
Catalytic processes are one of the most effective processes used in the synthesis of compounds with high added value. At present, much attention is paid to environmentally friendly technological solutions compliant with the requirements of the so-called "*Green chemistry*". The above-mentioned requirements can be met by using natural catalysts - enzymes. Enzymes from the class of hydrolases (EC 3), and among them lipases and esterases are the most often used in organic synthesis. The catalytic efficiency of hydrolases, which can manifest itself in a number of different types of reactions, remains an open question. This property is called promiscuity and is defined as the ability of enzymes to catalyze additional processes that differ from those of natural chemical reactions.[1] α-Hydroxy and α-amino phosphonates have become increasingly important for their agricultural and pharmaceutical.[2] A large number of methodologies for the synthesis of these compounds have been developed. However, majority of these processes suffer some drawbacks such as stoichiometric amount of catalysts, costly metal ion and the use of highly toxic catalysts. Due to pharmacopoeia limits of heavy metal contaminations (below 5 ppm) reported methods cannot be used in the pharmaceutical and cosmetic industry. The results of our studies on promiscuous enzymatic carbon–phosphorus bond formation leading to α-hydroxy and α-amino phosphonates will be presented (Scheme 1).[3] The influence of the reaction conditions, reaction media and enzyme type on the reaction course will be discussed.



Scheme 1. Enzymatic carbon–phosphorus bond formation.

References

[1] B. P. Dwivedee, S. S. M. Sharma, J. Bhaumik, J. K. Laha, *ChemSelect*, **2018**, *3*, 2441-2466.
[2] P. Kafarski, B. Lejczak, *Phosphorus Sulfur Silicon Related Elem*. **1991**, *63*, 193-215.
[3] D. Koszelewski, R. Ostaszewski, *ChemCatChem* **2019**, *11*, 2554-2558.

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