Preparation of pectate lyase/$Cu_3(PO_4)_2$ hybrid nanoflower and its catalytic performance as an immobilized enzyme

Pan Wu

State Key Laboratory of Biocatalysis and Enzyme Engineering, Hubei Collaborative Innovation Center for Green Transformation of Bio-Resources, School of Life Sciences, Hubei University, Wuhan, 430062, China

Email: wupan@hubu.edu.cn

Abstract

Biocatalysts could substitute conventional chemical reagents in textile industrial process for green-production process as well as lowering the costs. Alkaline pectate lyases (Pels) are enzymes that could be used in scouring and degumming process, in which the biochemical properties of Pels with high activity and stability under process conditions are of great interests. In our previous studies, an alkaline pectate lyase PEL168 derived from *Bacillus subtilis* 168 was engineered with improved enzymatic performance. The obtained Pel3 mutant presented an increased specific activity of 4.3-fold and extended T_{50} to 330 min. Here, we introduce a facile and rapid method of preparing an immobilized enzyme Pel3-inorganic hybrid nanoflower to increase its biocatalytic efficiency. After evaluating four divalent ions, including Mn^{2+}, Ca^{2+}, Zn^{2+} and Cu^{2+} as inorganic part with PBS buffer, Pel3/$Cu_3(PO_4)_2$ hybrid nanoflower was obtained with improved biocatalytic properties. The optimum temperature and pH of Pel3/$Cu_3(PO_4)_2$ hybrid nanoflower were determined to be 55℃ and pH 9, respectively, exhibiting subtle difference from the free Pel3. However, the Pel3/$Cu_3(PO_4)_2$ hybrid nanoflower maintained 33% total activity after treated at 55℃ in 24 h, while the free Pel3 completely lost its activity in 18 h. Furthermore, the residual activity of the Pel3/$Cu_3(PO_4)_2$ hybrid nanoflowers remain over 50% even after four times of repeatitive utilization, demonstrating its promising stability for practical application.

Brief Biography

Dr. Pan Wu is a lecturer of School of Life Science at Hubei University after she obtained her PhD degree from Wuhan University in 2017. Her research mainly focuses on enzyme engineering, natural products biosynthesis and mycotoxins catabolism. She has published SCI papers as first and co-first author in reputational journal including *Angewandte Chemie International Edition*, *Cell Chemical Biology*, *Chemical Science,* and *Applied Environmental Microbiology* et al. She also obtained The Second Prize of Academic Innovation Award at Wuhan University in 2017.

Brief CV

Pan Wu, Ph.D.

School of Life Sciences, Hubei University

Education:

B.S. Applied Chemistry, Wuhan Textile University, China, 2010

MA.Eng. Chemical Engineering, Wuhan University, China, 2012

Ph.D. Biochemistry and Molecular Biology, Wuhan University, China, 2017

Professional Career:

2017-Present: Hubei University, China, Lecturer

Research Interests:

1. Enzyme engineering
2. Mycotoxin catabolism
3. Natural products biosynthesis

Publications

1. **Pan Wu**[#], Dan Wan[#], Gudan Xu[#], Gui Wang, Hongmin Ma, Tingting Wang, Yaojie Gao, Jianzhao Qi, Xiaoxia Chen, Jian Zhu, Yong-Quan Li, Zixin Deng, Wenqing Chen[*], An Unusual Protector-protege Strategy for the Biosynthesis of Purine Nucleoside Antibiotics. ***Cell Chemical Biology***, 2017, 24(2):171-181
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4. Qiang Liu#, **Pan Wu**#, Yuhong Yang, Ziqi Zeng, Jie Liu, Hong Yi, Aiwen Lei*, Room-temperature copper-catalyzed oxidation of electron-deficient arenes and heteroarenes using air. ***Angewandte Chemie International Edition***, 2012, 51(19):4666-70