Hui Wu

Department: School of Biotechnology

Professional field: Metabolic engineering and synthetic biology

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Profile

I am an Associate Professor in East China University of Science & Technology (ECUST). I am the Vice Director of Key Laboratory of Bio-based Material Engineering of China National Light Industry Council and the member of State Key Lab of Bioreactor Engineering of China. I obtained B.S. degree from Nanjing University of Technology in 2005 and Ph.D degree from ECUST in 2009. I worked as Postdoctoral Research Fellow in Key Laboratory of Synthetic Biology, Institute of Plant Physiology and Ecology, Shanghai Institutes for Biological Sciences, CAS during 2009 to 2011, and as Postdoctoral Research Associate in Department of Bioengineering, Rice University during 2011 to 2014. From 2014, I jointed ECUST and was elected as the member of State Key Laboratory of Bioreactor Engineering. I published more than 35 papers in Metabolic Engineering, Biotechnology Advances, Applied and Environmental Microbiology, Biotechnology and Bioengineering, and other peer-reviewed scientific journals, and has applied 6 US patents with 3 issued, and 11 Chinese invention patents with 5 issued. I am the associated editor of Frontiers in Microbiology (2019-). My recent research focuses on microbial metabolic engineering, metabolic regulation, and synthetic biology.

Research Field

1. Metabolic Engineering and Metabolic Regulation

Microbial biosynthesis of sustainable biofuels or biochemicals from renewable feedstocks, such as lignocellulose biomass from forest and agricultural residue, has attracted significant attention in recent years. Our team is focusing on the engineering and manipulating microbial systems (E. coli, Klebsiella peneumoniae, etc) to biosynthesize various useful biofuels, bulk chemicals and pharmaceuticals from renewable feed stocks, such as Succinic acid, 3-Hydroxypropionic acid, 1,3-Propanediol, Acetone, Free fatty acids with different chain length, etc.

2. Synthetic Biology -- "Metabolic Transistor"

In this approach of "metabolic transistor", a small change in the level or availability of an essential component for the process is controlled by adding a competitive reaction that affects a precursor or an intermediate in its biosynthetic pathway.

3. CO2 fixation based on Microbial-electrochemical System

Engineered autotrophic E. coli strains will be constructed to fix CO2 which based on the Microbial-electrochemical System by using the strategies of metabolic engineering and synthetic biology. Our team is focusing on using the engineered strains to synthesize various useful biofuels and bulk chemicals, such as Acetone, Isopropanol, Succinic acid, 3-Hydroxypropionic acid, etc.

Research results and selected published papers

1. Yane Luo*, Tao Zhang, Hui Wu*. 2014. The transport and mediation mechanisms of the common sugars in Escherichia coli. Biotechnology Advances. 32: 905-919.

2. Guohui Li, Dixuan Huang, Xue Sui, Shiyun Li, Bing Huang, Xiaojuan Zhang*, Hui Wu*, Yu Deng*. 2020. Advances in microbial production of medium-chain dicarboxylic acids for nylon materials. Reaction Chemistry & Engineering. 5:221-238

3. Hao Yang, Can Zhang, Ningyu Lai, Bing Huang, Peng Fei, Dawei Ding, Peng Hu, Yang Gu, Hui Wu*. 2020. Efficient isopropanol biosynthesis by engineered Escherichia coli using biologically produced acetate from syngas fermentation. Bioresource Technology. 296:122337.

4. Yunpeng Yang#, Nannan Lang#, Lu Zhang, Hui Wu, Weihong Jiang*, Gu Yang*. 2020. A novel regulatory pathway consisting of a two-component system and an ABC-2 type transporter controls butanol tolerance in Clostridium acetobutylicum. Applied Microbiology and Biotechnology. DOI: 10.1007/s00253-020-10555-6

5. Jiawei Li, Xiaoyan Zhang, Hui Wu, Yunpeng Bai*. 2020. Transcription factor screening and engineering for metabolic engineering and production of organic acids: an overview. Frontiers in Bioengineering and Biotechnology. 8:98

6. Qiaofei He, George N. Bennett, Ka-Yiu San, Hui Wu*. 2019. Biosynthesis of medium-chain ω-hydroxy fatty acids by AlkBGT of Pseudomonas putida GPo1 with native FadL in engineered Escherichia coli. Frontiers in Bioengineering and Biotechnology. 7:273.

7. Hao Yang#, Bing Huang#, Zhimin Li, Qin Ye, Hui Wu*. 2019. Metabolic engineering of Escherichia coli carrying the hybrid acetone-biosynthesis pathway for efficient acetone biosynthesis from acetate. Microbial Cell Factories. 18:6

8. Jingxian Lu, Zhimin Li, Qin Ye, Hui Wu*. 2019. Effect of reducing the activity of respiratory chain on biosynthesis of poly(3-hydroxybutyrate-co-lactate) in Escherichia coli. Chinese Journal of Biotechnology 35(1):59-69.

9. Boliang Gao, Li Li, Hui Wu, Du Zhu, Min Jin, Wu Qu, Runying Zeng*. 2019. A novel strategy for efficient agaro-oligosaccharide production based on the enzymatic degradation of crude agarose in Flammeovirga pacifica WPAGA1. Frontiers in Microbiology.10:1231.

10. Xiangwei Cui, Junxian Wan, Xing Zhang, Hui Wu, Zhimin Li*, Qin Ye. 2019. Efficient glutathione production in metabolically engineered Escherichia coli strains using constitutive promoters. Journal of Biotechnology. 289: 39-45

11. Jiapeng Tang, Zhenqing Qian, Hui Wu*. 2018. Enhancing cordycepin production in liquid static cultivation of Cordyceps militaris by adding vegetable oils as the secondary carbon source. Bioresource Technology. 268:60-67.

12. Bing Huang, Hao Yang, Guochen Fang, Xing Zhang, Hui Wu*, Zhimin Li*, Qin Ye. 2018. Central pathway engineering for enhanced succinate biosynthesis from acetate in Escherichia coli. Biotechnology and Bioengineering. 115:943-954.

13. Wei Li#, Hui Wu#, Mai Li, Ka-Yiu San*. 2018. Effect of NADPH availability on free fatty acid production in E. coli. Biotechnology and Bioengineering. 115:444-452.

14. Han Liu, Guochen Fang, Hui Wu*, Zhimin Li*, Qin Ye. 2018. L-cysteine production in Escherichia coli based on rational metabolic engineering and modular strategy. Biotechnology Journal. 13:e1700695.

15. Feng Li#, Yuanxiu Li#, Liming Sun, Xiaoli Chen, Xingjuan An, Changji Yin, Yingxiu Cao, Hui Wu, Hao Song*. 2018. Modular engineering intracellular NADH regeneration boosts extracellular electron transfer of Shewanella oneidensis MR-1. ACS Synthetic Biology. 7(3):885-895.

16. Qing Li#, Bing Huang#, Qiaofei He, Jingxian Lu, Xun Li, Zhimin Li, Hui Wu*, Qin Ye. 2018. Production of succinate from simply purified crude glycerol by engineered Escherichia coli using two-stage fermentation. Bioresources and Bioprocessing. 5:41.

17. Jiaqi Jiang, Bing Huang, Hui Wu*, Zhimin Li*, Qin Ye. 2018. Efficient 3-hydroxypropionic acid production from glycerol by metabolically engineered Klebsiella pneumoniae. Bioresources and Bioprocessing. 5:34.

18. Qing Li, Bing Huang, Hui Wu*, Zhimin Li, Qin Ye. 2017. Efficient anaerobic production of succinate from glycerol in engineered Escherichia coli by using dual carbon sources and limiting oxygen supply in preceding aerobic culture. Bioresource Technology. 231: 75-84.

19. Xing Zhang#, Hui Wu#, Bing Huang, Zhimin Li*, Qin Ye. 2017. One-pot synthesis of glutathione by a two-enzyme cascade using a thermophilic ATP regeneration system. Journal of Biotechnology. 241:163-169.

20. Qing Li#, Hui Wu#, Zhimin Li, Qin Ye*. 2016. Enhanced succinate production from glycerol by engineered Escherichia coli strains. Bioresource Technology. 218:217-223. (# First two authors contributed to this paper equally)

21. Yunjie Li, Bing Huang, Hui Wu*, Zhimin Li*, Qin Ye, Yi-Heng Percival Zhang. 2016. Production of succinate from acetate by metabolically engineered Escherichia coli. ACS Synthetic Biology. 5:1299-1307.

22. Jianhua Yang, Wei Li, Dezheng Wang, Hui Wu*, Zhimin Li*, Qin Ye. 2016. Characterization of bifunctional L-glutathione synthetases from Actinobacillus pleuropneumoniae and Actinobacillus succinogenes for efficient glutathione biosynthesis. Applied Microbiology and Biotechnology. 100 (14): 6279-6289.

23. Jing Zhang, Cong Quan, Cheng Wang, Hui Wu*, Zhimin Li*, Qin Ye. 2016. Systematic manipulation of glutathione metabolism in Escherichia coli for improved glutathione production. Microbial Cell Factories. 15:38.

24. Zhuan Cheng, Jiaqi Jiang, Hui Wu, Zhimin Li*, Qin Ye. 2016. Enhanced production of 3-hydroxypropionic acid from glucose via malonyl-CoA pathway by engineered Escherichia coli. Bioresource Technology. 200: 897-904.

25. Dezheng Wang, Cheng Wang, Hui Wu*, Zhimin Li*, Qin Ye. 2016. Glutathione production by recombinant Escherichia coli expressing bifunctional glutathione synthetase. Journal of Industrial Microbiology and Biotechnology. 43:45-53. (*Co-corresponding)

26. Cheng Wang, Jing Zhang, Hui Wu*, Zhimin Li*, Qin Ye. 2015. Heterologous gshF gene expression in various vector systems in Escherichia coli for enhanced glutathione production. Journal of Biotechnology. 214:63-68.

27. Hui Wu, Leepika Tuli, George N. Bennett, Ka-Yiu San*. 2015. Metabolic transistor strategy for controlling electron transfer chain in Escherichia coli. Metabolic Engineering. 28: 159-168.

28. Hui Wu, George N. Bennett, Ka-Yiu San*. 2015. Metabolic control of respiratory levels in coenzyme Q biosynthesis-deficient Escherichia coli strains leading to fine-tune aerobic lactate fermentation. Biotechnology and Bioengineering. 112(8):1720-1726.

29. Hui Wu, Jane Lee, Mukund Karanjikar, Ka-Yiu San*. 2015. Simultaneous utilization of glucose and mannose from woody hydrolysate for free fatty acid production by metabolically engineered Escherichia coli. Bioresource Technology. 185: 431-435.

30. Dan Wang, Hui Wu, Chandresh Thakker, Jared Beyersdorf, George N Bennett, Ka-Yiu San*. 2015. Efficient free fatty acid production in engineered Escherichia coli strains using soybean oligosaccharides as feedstock. Biotechnology Progress. 31:686-694.

31. Hui Wu, Mukund Karanjikar, Ka-Yiu San*. 2014. Metabolic engineering of Escherichia coli for efficient free fatty acid production from glycerol. Metabolic Engineering. 25: 82-91.

32. Hui Wu, Ka-Yiu San*. 2014. Efficient odd numbered straight-chain free fatty acid production by metabolically engineered Escherichia coli. Biotechnology and Bioengineering. 111(11): 2209-2219.

33. Hui Wu, Jane Lee, Mukund Karanjikar, Ka-Yiu San*. 2014. Efficient free fatty acid production from woody biomass hydrolysate in metabolically engineered Escherichia coli. Bioresource Technology. 169: 119-125.

34. Hui Wu, Ka-Yiu San*. 2014. Engineering Escherichia coli for odd straight medium chain free fatty acid production. Applied Microbiology and Biotechnology. 98(19): 8145-8154.

35. Hui Wu, Qing Li, Zhi-min Li*, Qin Ye*. 2012. Succinic acid production and CO2 fixation using a metabolically engineered Escherichia coli in a bioreactor equipped with a self-inducing agitator. Bioresource Technology. 107:376-384.

36. Yuan Liu♯, Hui Wu♯, Qin Li, Xuwei Tang, Zhi-min Li*, Qin Ye. 2011. Process development of succinic acid production by Escherichia coli NZN111 using acetate as an aerobic carbon source. Enzyme and Microbial Technology. 49(5):459-64.

37. Yang Gu, Yu Jiang, Hui Wu, Xudong Liu, Zhilin Li, Jian Li, Han Xiao, Zhaobing Shen, Hongjun Dong, Yunliu Yang, Yin Li, Weihong Jiang*, Sheng Yang*. 2011. Economical challenges to microbial producers of butanol: feedstock, butanol ratio and titer. Biotechnology Journal. 6 (11):1348-1357.

38. Hui Wu, Zhi-min Li, Li Zhou, Jingli Xie, Qin Ye*. 2009. Enhanced anaerobic succinic acid production by Escherichia coli NZN111 aerobically grown on gluconeogenetic carbon sources. Enzyme and Microbial Technology. 44:165-169

39. Hui Wu, Zhi-min Li, Li Zhou, Qin Ye*. 2007. Improved succinic acid production in the anaerobic culture of an Escherichia coli pflB ldhA double mutant as a result of enhanced anaplerotic activities in the preceding aerobic culture. Applied and Environmental Microbiology. 73:7837-7843.