Engineering Dynamic Cellular Metabolism for Microbial Manufacturing

State Key Laboratory of Chemical Resource Engineering

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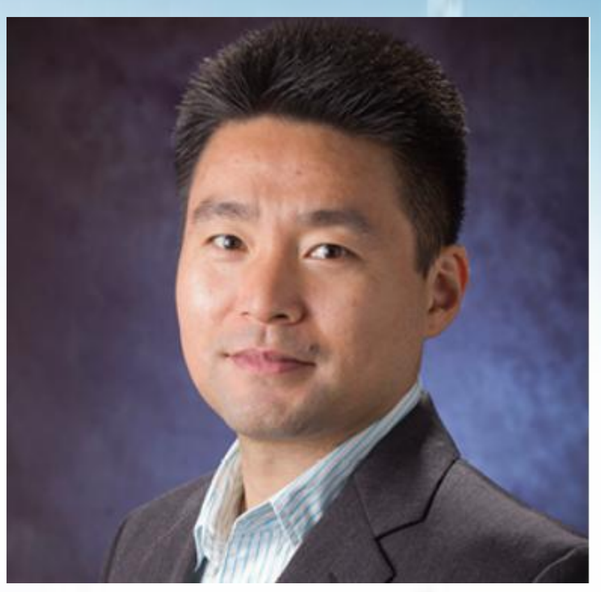

个人简介：

Yajun Yan got his Bachelor's degree (1999) and Master's degree (2002) in Biochemical Engineering at Beijing University of Chemical Technology. In 2008, he got his Ph.D. degree at the State University of New York at Buffalo in the Department of Chemical and Biological Engineering. During this period, his research focus was metabolic engineering. From 2008-2010, he did his postdoctoral research at the University of California, Los Angeles with further training in metabolic engineering and synthetic biology. In 2010, Dr. Yan joined the University of Georgia as an assistant professor of Biochemical Engineering and was promoted to associate professor with tenure in 2015. His current research interests are metabolic engineering and synthetic biology with applications in developing enzymatic and microbial approaches for the production of pharmaceutically important compounds as well as renewable fuels and chemicals.

报告摘要：

Achieving viable productivities, titers and yields is extremely critical to microbial production. However, cellular and environmental changes may greatly impair microbial production due to that the producing hosts are incapable of responding to the changes dynamically. Thus, it is highly desired to develop dynamic control techniques to engineer cells with great biological robustness, which can automatically adjust their metabolic activities to the changing conditions to realize optimal production efficiency. In this presentation, we describe a general strategy for developing regulatory networks to implement dynamic controls of cellular metabolism for production improvement in microbial hosts. The regulatory elements consist of promoter, sensor-regulator, and antisense RNA. The dynamic regulation can occur at both transcriptional and post-transcriptional levels and involve not only heterologous genes but also host native metabolism. More importantly, this dynamic regulation can execute orthogonal and simultaneous "up-regulation" and "down-regulation" functions through using a single promoter-regulator system in response to the same inducing molecule, As a proof-of-concept, we utilize the muconic acid biosynthetic pathway developed in our group to examine the efficiency of this strategy on muconic acid production in Escherichia coli. Briefly, the research work involves the development and characterization of hybrid promoter-regulator system and dynamic regulatory network, and examination of the efficiency of dynamic regulatory network on muconic acid production.

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