

Amgen Seminar Series in Chemical Engineering

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A Systems Biology Approach to the Development of Commercial Bioprocesses: 1,4-butanediol and beyond

By



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Production of biobased chemicals by fermentation at competitive titer, rate, and yield involves optimizing the cellular resources normally devoted to biomass formation and directing them towards product formation. Systems and synthetic biology tools are the key to surmounting these challenges. As an example success of this approach, Genomatica has developed a complete bioprocess for commercial scale production of 1,4-butanediol (BDO) from carbohydrate feedstocks. BDO is a chemical intermediate (> 3B lbs/yr) that goes into a variety of products including automotive parts and apparel, and is currently produced commercially through energy-intensive petrochemical processes. Systems biology, diagnostic ‘omics’ experiments, and novel synthetic biology tools will be emphasized to highlight the importance of rational metabolic engineering approaches for achieving high level strain performance.

Bio: Dr. Van Dien is an expert in the areas of metabolic engineering, industrial microbiology, and mathematical modeling of biological systems. As Sr. Director of Technology at Genomatica, he has been leading the Company’s efforts at engineering microbes for the production of industrial chemicals from renewable resources. He received his B.S. in Chemical Engineering at Rice University in 1991, and a doctorate in Chemical Engineering from U.C. Berkeley under the direction of Professor Jay Keasling. He then held two postdoctoral positions, one in the laboratory of Victor de Lorenzo in Madrid, Spain as an NSF-NATO fellow, and a second in Mary Lidstrom’s laboratory at the University of Washington. In September of 2002 he was recruited by Ajinomoto Co. (Kawasaki, Japan) to help develop computational biology and metabolic engineering programs, and to train permanent personnel in these areas. He joined Genomatica in November 2003, where he focused on the integration of metabolic models with experimental data, and led the Company’s efforts in the bioprocessing sector. He has led multiple projects including the development of a process for the production of 1,4-butanediol (BDO) from sugars, which has been recently commercialized. He and his team apply a systems biology approach, using omics data and modeling to overcome challenges in developing production strains. In June 2017, Dr. Van Dien left Genomatica to become co-founder of Persephone Biome, a company developing nutritional products to support the human gut microbiome.

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