Realization of low carbon society through game changing technologies

Development of electro-fermentation processes for producing long-chain polyhydric alcohols

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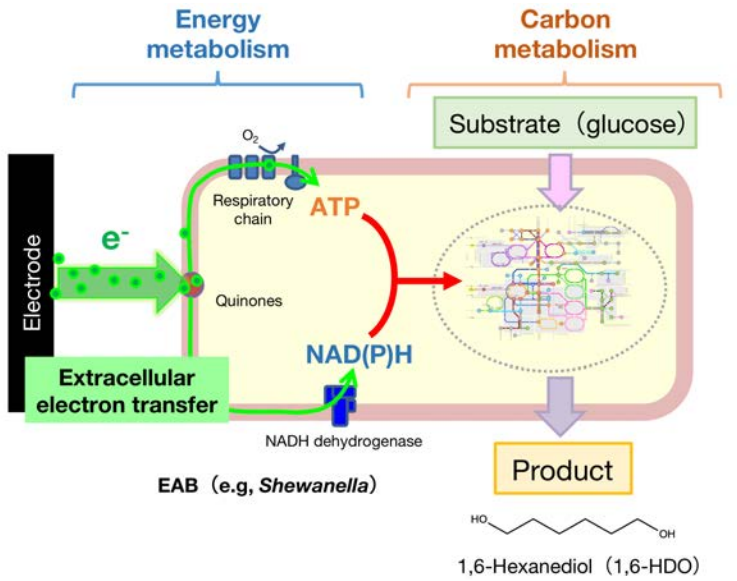
Summary :

This study aims to develop a bioproduction process for synthesizing 1,6-hexanediol (1,6-HDO) from glucose. 1,6-HDO is a commodity chemical used as a building block of polyurethanes and is currently produced by petrochemical processes. However, 1,6-HDO is a highly reduced and energy-rich material, making it difficult to produce 1,6-HDO by conventional fermentation methods. In this study, we will develop an "electro-fermentation" method that can efficiently produce 1,6-HDO using electricity as an energy source. Specifically, we will engineer electrochemically active bacteria (EAB), e.g., *Shewanella oneidensis* MR-1, to express a 1,6-HDO synthesis pathway. We will also develop a bioelectrochemical reactor that can efficiently supply electrons to engineered EAB. Based on these developments, we will demonstrate that the electro-fermentation process can efficiently produce 1,6-HDO with significantly lower CO_2 emissions than the conventional petrochemical processes.



Electricity is used for the generation of NAD(P)H and ATP, facilitating the conversion of glucose into 1,6-HDO