Design and construction of a semi-cycle system of oxygen supplied intensification using hydrogen peroxide for high-performance glucose oxidation

Caixia Cui[1], Mengyuan Kong[1], Tingting Xia[1], Chenyan Zhou[1], and Hong Ming[1]

[1]Xinxiang Medical University

April 05, 2024

Abstract

In the past decade, glucose conversion has attracted increasing attention for use in both biosensor preparation and gluconic acid synthesis. However, differences in glucose concentration have led to different research priorities. Here, we sought to study the limited conditions for synthesizing high concentrations of gluconate using glucose oxidase and catalase. Considering product inhibition and the oxygen supplied limitations posed by gluconic acid and dissolved oxygen (DO), we present here a method using continuous glucose flow to the system along with the addition of H2O2 to the system as an oxygen precursor. Then the two features were coupled, constructing a novel, semi-cycle oxygen regeneration system to improve the product space-time yield. The effects of glucose and H2O2 addition on reaction rate were tested; the amount of gluconate yield was also assessed. Results indicated that glucose conversion was consistent with the DO value of the system; moreover, that the gluconate space-time yield was up to 61.3 g/L/h—36-fold increase when compared with unregulated gluconate synthesis. Collectively, these findings identified reaction conditions that use H2O2 as an oxygen precursor for suppling oxygen, thus guiding the design of an enzymatic reaction that using oxygen for its enzyme catalyzed system.

Hosted file

A_S_C.docx available at https://authorea.com/users/74463/articles/711573-design-and-construction-of-a-semi-cycle-system-of-oxygen-supplied-intensification-using-hydrogen-peroxide-for-high-performance-glucose-oxidation