Gas pressure intensifying oxygen transfer to significantly improving bio-oxidation productivity of whole-cell catalysis

Xia Hua[1], Jian Han[2], Xin Zhou[1], and Yong XU[1]

[1]Affiliation not available
[2]Nanjing Forestry University

August 20, 2022

Abstract

Oxygen, as a terminal electron acceptor, is an essential substrate in the aerobic bio-oxidation process, affecting bacterial vitality and bio-oxidation performance. In this study, a new and smart platform biotechnology of sealed-oxygen supply bioreactor (SOS-BR) was developed by improving gas pressure to significantly intensify oxygen transfer rate and resolving the formidable barriers of aerobic catalysis. In virtue of SOS-BR, the bio-productivity was greatly improved for three representative substrates (xylose, furfural, glycerol) bio-oxidation with the whole-cell catalysis of Gluconobacter oxydans. The determination of oxygen transfer coefficient (KLα) established an upgraded theoretical dynamic model for gas pressure intersification biosystem. Additionally, viscosity measurement and combined pressure control strategy explained the inflection point phenomenon of productivity and confirmed the intensify mechanism. The new strategy of significantly intensifying oxygen transfer provided insightful ideas for overcoming the subbon obstacle of obligate aerobic catalysis, and further promoted industrial practicability of bio-oxidation.

Hosted file

`Manuscript.docx` available at https://authorea.com/users/502486/articles/582505-gas-pressure-intensifying-oxygen-transfer-to-significantly-improving-bio-oxidation-productivity-of-whole-cell-catalysis