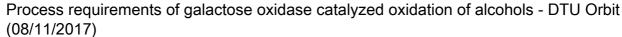
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## Process requirements of galactose oxidase catalyzed oxidation of alcohols

Biocatalytic oxidation reactions have the potential to substitute many chemically catalyzed oxidations in the pharmaceutical and fine chemical industry due to their superior regio- and stereoselectivity and low environmental impact. Galactose oxidase (GOase) has been shown to be a promising biocatalyst for the oxidation of primary and secondary alcohols to their corresponding aldehydes and ketones, respectively. However, GOase requires a number of additives to sustain its catalytic function, such as the enzyme catalase for degradation of the byproduct hydrogen peroxide as well as single-electron oxidants to reactivate the enzyme upon loss of the amino acid radical in its active site. In this work, the addition of catalase, single-electron oxidants, and copper ions was investigated systematically in order to find the minimum concentrations required to obtain a fully active GOase. Furthermore, it was found that the concentration and type of buffer is essential for the activity of GOase, which was significantly more active in sodium phosphate buffer than in other buffers investigated. Enzyme stability and oxygen requirements are of crucial importance for the implementation of oxidase based processes. GOase was shown to be completely stable for 120 h in buffer with stirring at 25 °C, and the activity even increased 30% if the enzyme solution was also aerated in a similar experiment. The high  $K_{\rm m}$  for oxygen of GOase (>5 mM) relative to the solubility of oxygen in water reveals a trade-off between supplying oxygen at a sufficiently high rate and ensuring a high degree of enzyme utilization (i.e., ensuring the highest possible specific rate of reaction). Nevertheless, the good stability and high activity of GOase bode well for its future application as an industrial biocatalyst.

## General information

State: Published

Organisations: Department of Chemical and Biochemical Engineering, CAPEC-PROCESS, University of Manchester,

Prozomix Ltd

Authors: Pedersen, A. T. (Intern), R. Birmingham, W. (Ekstern), Rehn, G. (Intern), J. Charnock, S. (Ekstern), J. Turner, N.

(Ekstern), Woodley, J. M. (Intern)

Pages: 1580–1589 Publication date: 2015

Main Research Area: Technical/natural sciences

## Publication information

Journal: Organic Process Research and Development

Volume: 19 Issue number: 11 ISSN (Print): 1083-6160

Ratings:

BFI (2017): BFI-level 1

Web of Science (2017): Indexed Yes

BFI (2016): BFI-level 1

Scopus rating (2016): CiteScore 2.48 SJR 1.062 SNIP 0.859

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 1

Scopus rating (2015): SJR 1.318 SNIP 1.029 CiteScore 2.54

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 1

Scopus rating (2014): SJR 1.027 SNIP 0.99 CiteScore 2.38

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 1

Scopus rating (2013): SJR 1.13 SNIP 0.977 CiteScore 2.44

ISI indexed (2013): ISI indexed yes Web of Science (2013): Indexed yes

BFI (2012): BFI-level 1

Scopus rating (2012): SJR 1.185 SNIP 1.12 CiteScore 2.32

ISI indexed (2012): ISI indexed yes Web of Science (2012): Indexed yes

BFI (2011): BFI-level 1

Scopus rating (2011): SJR 1.212 SNIP 0.914 CiteScore 2.22

ISI indexed (2011): ISI indexed yes Web of Science (2011): Indexed yes

BFI (2010): BFI-level 1

Scopus rating (2010): SJR 1.114 SNIP 0.97

Web of Science (2010): Indexed yes

BFI (2009): BFI-level 1

Scopus rating (2009): SJR 1.046 SNIP 0.922

BFI (2008): BFI-level 1

Scopus rating (2008): SJR 0.943 SNIP 0.901

Web of Science (2008): Indexed yes

Scopus rating (2007): SJR 1.012 SNIP 0.875

Web of Science (2007): Indexed yes

Scopus rating (2006): SJR 1.083 SNIP 0.882

Web of Science (2006): Indexed yes

Scopus rating (2005): SJR 0.847 SNIP 0.821 Scopus rating (2004): SJR 0.701 SNIP 0.787 Scopus rating (2003): SJR 0.421 SNIP 0.67 Scopus rating (2002): SJR 0.548 SNIP 0.869

Web of Science (2002): Indexed yes

Scopus rating (2001): SJR 0.636 SNIP 0.748 Scopus rating (2000): SJR 0.46 SNIP 0.768 Scopus rating (1999): SJR 0.533 SNIP 0.634

Original language: English

DOIs:

10.1021/acs.oprd.5b00278 Source: PublicationPreSubmission

Source-ID: 118439481

Publication: Research - peer-review > Journal article - Annual report year: 2015