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Biocatalytic Utilization of the Gaseous Substrate Butane in a Bubble Column Reactor

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PURPOSE OF THE ABSTRACT

Utilization of short chain alkanes is restrained by their low chemical reactivity, due to their structure of C-C and C-H bonds. However, this resource is abundant, easily accessible and can serve as a starting material for biocatalytic synthesis. For this reason two different promising approaches of biocatalytic reaction systems were investigated and characterized in a bubble column reactor for a highly selective activation of butane by monooxygenases:
1) Application of unspecific peroxygenases, AaeUPO[1], as a free enzyme catalysing the sub-terminal hydroxylation of butane to
2-butanol. As stoichiometric co-substrate only hydrogen peroxide is applied [2].
2) A whole cell approach with the membrane bound alkBGT enzyme system expressed in E. coli[3]. The hydroxylation of butane to 1-butanol is catalysed with subsequent oxidation to the final product butyric acid. The selection of suitable process parameters with a design of experiment approach (e.g. butane and oxygen supply, glucose feed and biomass) can yield high productivities. However, detailed knowledge on the effect of individual process variables (e.g. gassing rate, butane content, pressure and temperature) is mandatory.

FIGURES

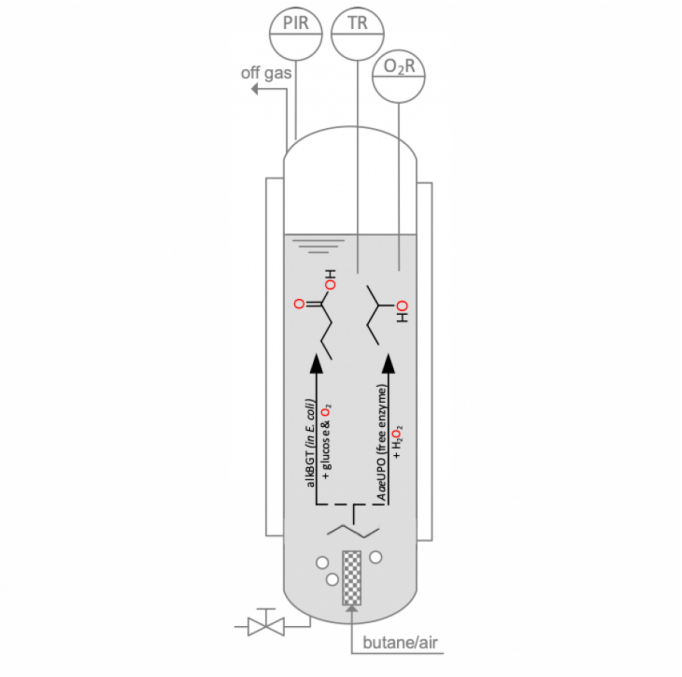

FIGURE 1

FIGURE 2

Figure 1

Scheme of the two applied reaction systems

KEYWORDS

Enzyme catalysis | Whole cell catalysis

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