Biotransformation of linear alkanes

This technology is based on existing technology known as EnBase®, developed and patented by the University of Oulu in Finland and commercialised through a spin out company.

The UCT technology enhances bioprocesses for the production of valuable oxygenated chemicals, such as alcohols, ketones, aldehydes, hydroxyacids, and dicarboxylic acids, from alkanes via enzymatic biotransformation. In contrast to conventional processes, the growing whole cells are used as the biocatalyst leading to a significant increase in catalyst efficiency and activity.

Large stockpiles of linear hydrocarbons have arisen as by-products from the global expansion of gas-to-liquid refining processes. An example is the alkane group of hydrocarbons.

Linear alkanes feature some of the strongest chemical bonds in nature and typically are of a low value due to their inertness. Beneficiation into valuable products is therefore an important area of research and development.

The enzymatic assisted release of glucose from starch is a patented technology known as EnBase®, developed for growing microorganisms. This the first time that EnBase® technology has been applied in biotransformation reactions and organic media.

Applying EnBase® technology to the biotransformation of alkanes has resulted in a number of unexpected advantages. For example, co-factor regeneration (a typical problem in conventional processes for the biotransformation of alkanes) has been improved through the stable supply of glucose through EnBase®.

Also, when using growing cells (log phase) as opposed to resting cells (stationary phase), the inventors achieved a 40% increase in catalyst efficiency and 1.8 times catalyst activity. This is an unexpected result as resting cells are widely considered to be about 50% more efficient than growing cells in biotransformation processes. This would greatly aid the conversion of alkanes into valuable products.

Benefits

The innovation presents one major advantage over legacy processes. The use of EnBase® technology allows for fed-batch conditions to be simulated, i.e. by controlling the supply of glucose, while the reactor is actually operated in batch mode.

Applications

The bioprocess has potential in large scale production of alcohols, ketones, aldehydes, hydroxyacids, dicarboxylic acids, and other valuable oxygenated chemicals, from alkanes.

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Biotransformation,
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Patent

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Technical description

The invention provides a method for whole-cell catalysed biotransformation of linear alkanes to oxygenate products in cells, where the cells are maintained in a growth medium as growing cells. The method includes the following steps:

step 1: controlled growth of the cells by incubating the cells in a medium, where a metabolically inactive substrate is enzymatically transformed into a metabolically active growth substrate at a controlled rate; and

step 2: a step of incubating the cells of step (1) in a biotransformation medium comprising a linear alkane, to catalyse the conversion of the linear alkane into the oxygenated product.

Intellectual Property Status

Type	Region	Application No	Filing Date	Priority Date
Priority founding	Great Britain	1411177.7	24-June-14	24-June-14

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