A single-step process for the preparation of highly pure alkyl esters used in making lactic acid, poly lactic acid

EXECUTIVE SUMMARY

A single-step process for preparation of highly pure alkyl esters, which is used in the manufacture of lactic acid and further to poly lactic acid – both with wide industrial and commercial applications

BACKGROUND

Highly pure alkyl esters, especially methyl lactate, have a very important and wide range of applications at an industrial level. The products formed in conventional processes are impure with residues of sodium sulphate and are corrosive; separation processes are expensive and energy intensive. In most of the processes, alkali metal is wasted in its sulfate form- cannot be recycled

TECHNOLOGY DESCRIPTION

NCL's process uses alkali metal carboxylate salts to convert to its respective pure alkyl esters by a single, direct esterification step. Alkali metal salts used are prepared from natural sources. This process results in alkyl esters of very high purity (99.5-99.8%). The use of mineral acid is eliminated in this process – hence, no undesired sulfate side products are generated. The resulting methyl lactate can be hydrolyzed to get pure lactic acid.

MARKET POTENTIAL

- The global market for polylactic acid (PLA) has been projected to grow from $1.2 billion in 2010 to $3.8 billion in 2016 at a CAGR of 18.7%[1]
- PLA, being a biodegradable plastic, is increasingly being used in eco-friendly packaging – hence providing growth potential; The US biodegradable plastic market is estimated to be around 350 million pounds and is expected to grow 15.5% annually, with PLA and polyesters as the fastest growing market segment[2]
- Lactic acid consumption, on the other hand, will continue to increase at about 7% PA from 2008 to 2013, at a global level[3]

1http://www.sunherald.com/2011/10/03/3479449/marketsandmarkets-global-lactic.html#ixzz1ZmfNhqo6(viewed04/10/11), 2html (viewed 03/10/11)http://www.freedoniagroup.com/Biodegradable-Plastic.html (viewed03/10/11), 3http://www.plastemart.com/Plastic-Technical-Article.asp?LiteratureID=1694&Paper=global-lactic-acid-PLA-market-pie-chart-world-consumption-lactic-acid-polyethylene-terephthalate (viewed03/10/11)

VALUE/ADVANTAGES

- The products are of extremely high purity
- Pollution free process (by avoiding sulfate side-products)
- The byproducts (the corresponding carbonate salts) and the un-reacted carbon dioxide and alcohol can be recycled and reused in the process again –hence reducing cost

APPLICATIONS

- Methyl lactate is used in pharmaceuticals
- Lactic acid (derived from methyl lactate) is widely used in food industry and other applications
- Lactic acid is also used to produce poly lactic acid – which is a biocompatible and biodegradable polymer (hence with applications in packaging, biomedicine, etc.)

TECHNOLOGY STATUS

- Demonstrated at the lab scale; On the lookout for potential partners for spin-off/licensing
- Patent applications filed: Indian #-1842/DEL/2009, PCT #- IB2010/002203

Publication: Barve, PP et al. (2011)Preparation of Pure Methyl Esters from Corresponding Alkali Metal Salts of Carboxylic Acids Using Carbon Dioxide and Methanol, *Ind. Eng. Chem. Res,.* 51 (4), pp 1498–1505

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