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 segment2
• Lactic acid consumption, on the other hand, will continue to increase at about 7% PA from 2008 to 2013, at a global level3

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


CSIR-National Chemical Laboratory, Pune, India

Case Manager: Magesh. N.|+91-20-2590-2982|m.nandagopal@ncl.res.in www.nclinnovations.org