

BIO-BASED PRODUCTION AND DOWNSTREAM PROCESSING OF LACTIC ACID FOR APPLICATION IN POLYLACTIC ACID SYNTHESIS

The implementation of a sustainable bio-based economy is today's priority. Lignocellulose is a suitable alternative for the production of high added-value products. Lactic acid is being abundantly used worldwide for industrial and biotechnological applications. Lactic acid can be produced by microbial fermentation and chemical synthesis. The thesis assesses different lactic acid fermentation technologies and downstream processing.

Lignocellulosic biomass is promising renewable resource for the production of biofuels and platform chemicals. The present study encompasses the screening and isolation of lactic acid bacteria (LAB), stable in the presence of ionic liquids and lignocellulosic inhibitors and explores them for effective bio-based lactic acid production. A phase partitioning process using n-butanol and a chaotropic salt ammonium sulphate was developed to recover lactic acid from the fermentation broth. The pure lactic acid can further be used for enzymatic synthesis of high value-added product PLA, a biodegradable and biocompatible plastic.

Polylactic acid (PLA) is becoming one of the most paramount polymers due to its eco-friendly, biocompatible, and biodegradable nature. Mostly, PLA synthesis reaction uses a metal catalyst (Zn/Sn oxides), which is not safe for biomedical applications as it contains metal contamination. A bioprocess was developed for manufacturing high molecular weight PLA using an enzymatic polycondensation process. This new approach for the synthesis of metal-free degradable PLA would encourage its use for plastic and biomedical products in the future.