

World Congress on
BIOPOLYMERS AND BIOPLASTICS
&
World Congress and Expo on
RECYCLING

August 29 -30, 2018
Berlin, Germany

Synthesis of lactic acid using hydrogen cyanide extracted from cassava (*Manihot esculenta*) leaves

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Statement of the Problem: The racemic lactic acid (DL-LA) is produced by chemical synthesis from lactonitrile, derived from petrochemical resources or microbial fermentation of carbohydrates. Lactonitrile is used as starting material in the chemical synthesis of DL-LA. It is usually produced by reacting acetaldehyde and hydrogen cyanide (HCN) derived from petroleum or natural gas; therefore, making this process non-sustainable. However, it is possible to transform the once fossil fuel based chemical process into a cost effective and environmentally friendly process provided that the above mentioned chemicals are produced from renewable natural resources. For this reason, with acetaldehyde now being produced at industrial scale from bio-ethanol by SEKAB, this study will focus on producing HCN from Cassava leaves to be used in the chemical synthesis of

DL-LA. Methodology: HCN extracted from cassava leaves by steam distillation will be converted into sodium cyanide (NaCN), and then added to acetaldehyde after purification to produce lactonitrile, followed by hydrolysis to produce DL-LA. The latter will be purified by esterification with methanol, followed by hydrolysis with acidified water. The reliability of the HCN extraction method will be determined by reproducibility and repeatability tests, while the validity of the DL-LA synthesis method will be achieved by comparing the structure of the DL-LA synthesized against a standard using H1-NMR, FTIR and LC-MS. Significance: This research will contribute to the development of a green method for the chemical production of DL-LA.

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