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## LIFE CYCLE ASSESSMENT OF POLY (LACTIC ACID) (PLA): COMPARISON BETWEEN CHEMICAL RECYCLING, MECHANICAL RECYCLING AND COMPOSTING

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**T**his work aims to compare different routes of destination for poly(lactic acid) (PLA): chemical recycling, mechanical recycling and composting. Relevant environmental impacts of these alternatives were evaluated using LCA methodology. Composting and hydrolysis lab scale experiments were performed in order to obtain inventory data. Polymerization data in chemical recycling was obtained from computer simulation. Mechanical recycling data from lab scale were combined with the data from a plastics commercial mechanical recycling plant. The SimaPro<sup>®</sup> software was used as a tool to facilitate the LCA implementation. The database used for background processes was Ecoinvent 2.2. Two product systems were considered in this assessment. Restitution product system is based on the idea of restoring residual PLA, and consequently the amount that is not recycled should be produced again through traditional production system. Credit product system is based on the concept of all recycled PLA is a credit in the process, since it replaces PLA produced by traditional route. The different product systems presented similar results. Mechanical recycling showed the lowest environmental impacts, followed by the chemical recycling and composting.

Electricity consumption exhibited the highest impacts between the inputs for chemical and mechanical recycling of PLA. The results are coherent since the recycling alternatives permit to obtain polymer as an output. On the other hand, no polymer is produced in composting, since the final product is only the compost.

### Biography

Marina F Cosate de Andrade is a Chemical Engineer (2011) and holds a Master's in Chemical Engineering (2015) from the School of Chemical Engineering (FEQ)/University of Campinas (UNICAMP). Currently, she is a PhD student in Chemical Engineering at the Department of Materials Engineering and Bioprocess (DEMBio) of FEQ/UNICAMP. She has developed projects in mechanical and chemical recycling of poly(lactic acid) (PLA) and its life cycle evaluation (LCA) and PLA polymerization by direct polycondensation using chain extender. Besides, she also worked with 3D printing of PLA and poly(methyl methacrylate) (PMMA) nanocomposites. Her research interests are in the field of Biopolymers, Recycling, Life Cycle Assessment, 3D Printing and Nanocomposites..

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