

Production of Compostable Bio-Plastics from Food Waste: Design of Bench-scale Unit

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Abstract

Biodegradable plastic materials are an interesting alternative to petrol based ones for some applications because of the environmental benefits such as reduced greenhouse gas emissions and lower energy consumption. Furthermore, there is an added economic impact related to the petroleum shortage exists, the dependence on third countries (petroleum-producing countries) and the fluctuation of raw materials cost. However, biopolymers are mostly synthesized from different vegetables used in human feeding (sugar cane, soya, corn, potatoes, etc.), and their production can entail a series of environmental and social problems. In this scenario, it is very important to analyze and demonstrate the potential of other natural sources for plastic production as alternatives to the food itself. Biowaste to Bioplastic (B2B) project will identify all the parameters of the production process of PLLA monomers and (poly) lactic acid in relation to the quality characteristics of the raw material (bio-waste) collected from Hospitality Units. The production of bio-polymers and bio-plastics from food waste has been proven on a laboratory scale, with the main limitation being the variation in the quality and composition of the waste. All the above are tested on a bench-scale unit that allow their further study and their substantial improvement, as well as the extraction of realistic results. In this study is presented the designed and constructed bench scale unit within B2B project. In the Bench scale unit, the collected quantity of pre-selected organic fraction from Hospitality Units is conducted to processing. Initially, the preselected fraction is led into the pre-screening area, where a special belt is manually sorted. Depending on the raw material, a rotating sieve is used to optimize the raw material. Then the pure organic fraction is shredded. This shredded material is fed with a special pump to the PLLA (Poly-L-Lactic Acid) Bioplastic Production Unit. The production process for the production of poly-L-lactic acid (PLLA) from food waste involves the following steps: (a) Fermentation of propionic and lactic acid (1st Reactor & Centrifuge-Filtration system), (b) Purification of L-lactic acid (2nd Reactor), (c) Polymerization of L-lactic acid. The final PLLA product is used for the production of compostable bags.

Keywords: bio-plastics, food waste, bench scale unit, PLLA

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