Sustainable Biodegradable Polymers from Indonesian Renewable Resources, An Exploration of Potential Novel Processing Technologies and Raw Materials

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Introduction

Global consumption of plastic increases each year, and causes two serious problems: the depletion of petroleum oil as raw material, and an abundant amount of non-biodegradable plastic waste.

One of the possible solutions to overcome these problems is to identify another potential resource as a raw material that is both renewable and biodegradable such as a number of typical Indonesian starches (i.e: cassava, Job's Tears, and sago).

Prior to their application as thermoplastic materials, these biopolymers require a modification processes to improve several important product characteristics, such as hydrophobicity, mechanical strength and certain thermal properties. For example, a transesterification reaction of **sago starch** with **Palm Cooking Oil (PO)** and **Waste Palm Cooking Oil (WPO)** in an organic solvent and in sub/supercritical CO_2.

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Thermoplastics Starch

Main Objectives

The main objective of this research proposal is to evaluate the potential application of Indonesian starches such as sago starch as raw materials in transesterification with waste cooking oils such as Palm Oil (PO) for bioplastics production.

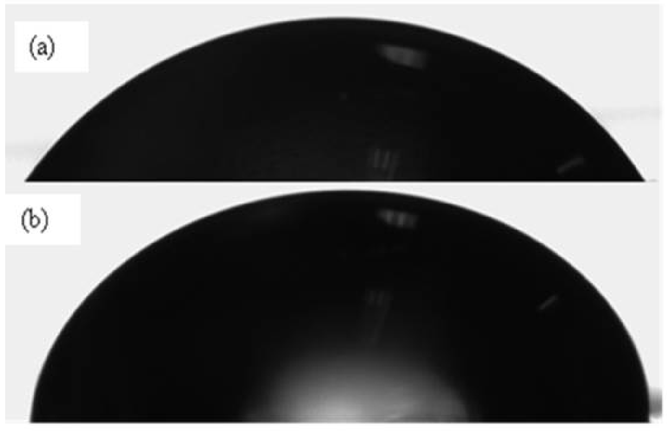
Approach

First Year :

1. Modification chemistry in organic solvent (DMSO) and CO_2
   Model Compound : Fatty acid vinyl esters and methyl esters cooking oil (Palm Oil, PO)
2. Fundamentals studies on phase behavior

Important Remarks (First Year Study)

- A broad range of Ester Content (EC) values (90.23 – 900 meq/kg) with an improve hidrophobicity can be obtained from the reaction of PO in sub/supercritical CO_2, and DMSO



Native Sago Starch

Improve Hydrophobicity

Sago Starch Esters

Fig 1. Contact angle measurement of the products

- Relatively high pressure (>300 bar) need to be applied in order to reach supercritical phase → external mass transfer limitation existed