UNIVERSITI TEKNOLOGI MARA

PREPARATION OF CERAMIC SUPPORT COATING USING TIN (II) OCTOATE: EFFECT OF POLYVINYL ALCOHOL (PVA) AND POLYETHYLENE GLYCOL (PEG) AS BINDERS

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ABSTRACT

Nowadays, it have been interest to produce immobilized tin (II) octoate catalyst on the surface of the ceramic support in the production of polylactic acid (PLA) from lactic acid (LA) due to easily recycle and separate the catalyst for reuse purpose. The objectives of this study is to prepare ceramic support coating by using PEG and PVA binders and to characterize the effect of ceramic support coating by using EDX and standard adhesion test. In this experiment, ceramic powder was obtained from the ceramic waste and used to make the support by mixing with diluted PVA in ratio of 3:1 before compressed to make it like coin shape and sintered in furnace at 1100 ^{o}C. Then, the thin layer of tin (II) octoate was prepared using nitric acid, ethylene glycol and different types of binders. Dip coating technique was used to coat the thin layer on the ceramic surface before sintered in an oven. Based on the EDX results, the composition of tin present in the thin layer containing PEG is 5.50 % compared to 0.46 % composition of tin present in the thin layer containing PVA binder. In additional, results from adhesion test shows thin layer sample containing PEG does not peel off from the ceramic surface while the thin layer containing PVA stick to the tape and peel off from the surface of ceramic at 37.5 %. PEG binder was recommended for the immobilization of high composition of the tin (II) octoate on the ceramic surface.

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CHAPTER ONE

INTRODUCTION

1.1 Background Study

Petroleum – based polymers is continues to dominate the worldwide production of high – volume consumer plastics. In these days, biodegradable polymers is said to be economically attractive due to several reasons. The reasons included environmental and economic concern regarding to waste disposal and increasing costs of petroleum production due to depletion of one of the most easily accessible reserves. Polylactic acid (PLA) has a great performance to be a new generation polymer and will enable to displace large volume of fossil fuel – based polymers because of versatility and easy of degradability as well as anticipated price (Bhunia et al., 2005). Polylactic acid (PLA) can be produced by using different routes. Generally, three methods that can be used to produce PLA which are direct condensation polymerization, azeotropic dehydrative condensation, and ring opening polymerization (Lopes, Jardini, & Filho, 2014).

Catalysts play an important role in many industries such as fine chemicals, energy and fuel, and commodity chemicals. Currently, it was estimated that 90% of chemical manufacturing processes involved catalytic step (Zhao et al., 2006). Catalytic processes are common in both industrial setting and research. Traditionally, catalyst immobilization techniques rely on the covalent grafting. This technique is suitable for continuous flow process due to strong interactions of the catalyst to the support (Nagy, 2011). Catalyst can be defines as a substances that added to the reaction to accelerates a rate chemical reaction without being consumed or produced in the process. Catalyst will form bonds with reacting molecules, and by allowing these to react to a product, which detaches from the catalyst, and leaves unaltered, so the catalyst is available for the next reaction (I. Chorkendorff, & J. W. Niemantsverdriet, 2007).