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EFFECT OF HA CONTENT TO THE THERMAL BEHAVIOUR AND CRYSTALLINITY OF PCL/HA COMPOSITE

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ABSTRACT

Polycaprolactone/hydroxyapatite (PCL/HA) composite is a hybridize bioactive inorganic particles which is one of the promising way in improving the mechanical properties with the strength brought by those ceramic, toughness with the bioactivity and osteoconductivity in tissue engineering. However, the present of HA may affect the crystallinity and heat properties of PCL/HA composite, where crystallinity and thermal properties of PCL/HA are very important and next foaming processing that is to create pore supercritical CO_2. This crystallinity will affect the diffusivity of CO_2 penetrate into PCL/HA composite. To reach the objective of this research, Thermogravimetric Analysis (TGA) used to investigate the effect of HA content in PCL/HA composite and Differential Scanning Calorimetry (DSC) to identify the crystallinity and thermal property of PCL/HA composite. In specifically studies on the character of PCL/HA, Fourier Transform Infrared (FTIR) was conducted to determine the functional group inside the PCL/HA composite. Besides that, sample that used in this study polymer is using the melt blending process at which may improve the homogenization of HA in PCL blend by ultrasonic wave. As a result, the pure PCL component degrades at 413.59ºC which clearly shows that PCL is completely degrade at 500ºC. As the high in HA content in the PCL/HA composites leads to decrease in crystallinity percentage because of the nucleation appear in the surface of the PCL composite.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

Every year, millions of people are suffer from bone defects emerging from trauma, a tumour alternately bone related infections. Furthermore, obviously several are dying due to not enough of ideal bone tissue (R.Murugan, 2004). Current therapies for bone defects or bone substitutes include autographs, allografts. However, these substitutes have couple restrictions. It is possibly connected with donor shortage and donor site morbidity whereas allografts can have the risk of disease transmission and immune response. The limits and the expected shortage of bone graft for surgical procedures, incited research dedicated on bone tissue engineering where a three-dimensional (3D) porous scaffold is loaded with specific living or tissue inducing growth factor/cytokines to launch a tissue recovery or supplanting done regular path.

Tissue engineering is an disciplinary experimental field that aims to the construction of fully functional biological tissues through procedure that combine the use of cells, biomaterials (scaffolds) and natural biologically active molecules (Coimbra *et al*., 2010). To bone tissue recovery three dimensional biocompatible porous scaffolds for an exceptionally interconnectedness porosity need aid required in place on permit cell migration, vascularization and supplement dissemination (Esfahani *et al*., 2010).