CHAPTER I

INTRODUCTION

Tissue engineering is the fabrication of three-dimensional bioscaffolds which could support cellular in-growth and cell proliferation. It has also been defined as "Understanding the principles of tissue growth, and applying it to produce functional replacement tissue for clinical use." (Langer & Vacanti, 1993). With advancement in medical care today tissue engineering has become one of the topics in focus concerning the ability to repair or replace portions of the damaged tissue and organs.

The key to producing successful bioscaffolds for tissue engineering is to mimic the extracellular matrix (ECM) which provides cells with a broad range of chemical signals that regulate cell functions. Various attempts had been made on producing successful bioscaffolds but came to face with many application issues such as, lack of cell poliferation and cell attachment. There are also issues with tissue rejection and unsuitable degradation rate along with specific mechanical properties that are needed to be met.

There are several factors needed to produce a bioscaffold for tissue engineering: 1) appropriate levels and sizes of porosity allowing for cell migration; 2) sufficient surface area and a variety of surface chemistries that encourage cell adhesion, growth, migration and differentiation; 3) allow diffusion of vital cell nutrients and wastes; 4) possess degradation rate that matches regeneration rate of specific natural tissue. (J. Lannutti, 2007) Concerning cell proliferation and cell attachment, the topology of the scaffold is very important. By the use of electrospinning method both natural and synthetic polymers can be produced into fine fibers at the range of 10 to 15 μm. Fine fibers will provide the scaffold with high surface area/unit mass.

The objective of this work is to optimize conditions and the components of materials which are used to fabricate bioscaffolds via the means of electrospinning. The main properties in focus are cell proliferation, cell attachment, cell toxicity and biocompatibility.