Shape-Memory Effect by Specific Biodegradable Polymer Blending for Biomedical Applications

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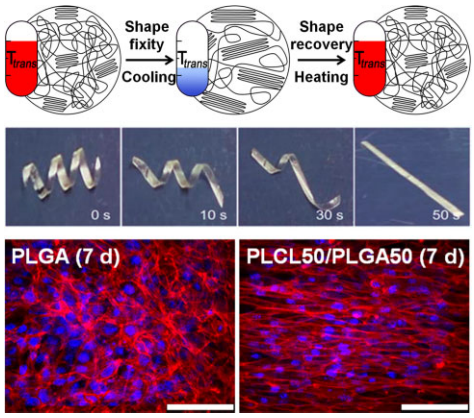
Specific biodegradable polymers having shape-memory properties through "polymer-blend" method are investigated and their shape-switching in body temperature (37 °C) is characterized. Poly(L-lactide-*co*-caprolactone) (PLCL) and poly(L-lactide-*co*-glycolide) (PLGA) are dissolved in chloroform and the films of several blending ratios of PLCL/PLGA are prepared by solvent casting. The shape-memory properties of films are also examined using dynamic mechanical analysis (DMA). Among the blending ratios, the PLCL50/PLGA50 film shows good performance of shape-fixity and shape-recovery based on glass transition temperature. It displays that the degree of shape recovery is 100% at 37 °C and the shape recovery proceeds within only 15 s. In vitro biocompatibility studies are shown to have good blood compatibility and cytocompatibility for the PLCL50/PLGA50 films. It is expected that this blended biodegradable polymer can be potentially used as a material for blood-contacting medical devices such as a self-expended vascular polymer stents and vascular closure devices in biomedical applications.



1. Introduction

Shape-memory polymers (SMPs) can change their shape from a temporary shape to a permanent shape upon application of external stimuli such as temperature,[1] light,[2] and moisture.[3] SMPs have been widely used for applications in sensors,[4] actuators,[5] and biomedical devices[6] due to ease of tailoring the physical properties including transition temperature, biodegradability, and stiffness and controlling of recovery behavior.

Most SMPs are thermo-responsive materials and they can be generally divided into two main categories according to their structures; physical cross-links and chemical cross-links.[7] For SMPs based on polymer networks with physical cross-links, the network chains as a kind of molecular switch can either be amorphous or crystalline. In this case,

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DOI: 10.1002/mabi.201300481