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ORIGINAL PAPER

Properties of poly(lactic acid-*co*-glycolic acid) film modified by blending with polyurethane

Guo-Quan Zhu, Fa-Gang Wang*, Hong-Sheng Tan, Qiao-Chun Gao, Yu-Ying Liu

School of Materials Science and Engineering, Shandong University of Technology, Zibo 255049, China

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A number of poly(lactic acid-*co*-glycolic acid)/polyurethane (PLGA/PU) blend films with various PU mole contents were prepared by casting the polymer blend solution in chloroform. The surface morphologies of the PLGA/PU blend films were studied by scanning electron microscopy (SEM). The thermal, mechanical and chemical properties of the PLGA/PU blend films were investigated by differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), tensile tests and surface contact angle tests. The results revealed that the introduction of PU could markedly modify the properties of PLGA films.

Keywords: morphology, properties, PLGA/PU blend film, SEM, DSC, TGA

Introduction

Polymer blending is recognised as a very useful method for improving or modifying the physicochemical properties of polymeric materials (Park et al., 2001). Some polymer blends exhibit excellent properties which would not be expected from homopolymers. One important property of the polymer blend is the miscibility of its ingredients, as it could affect the morphology, permeability, degradation and mechanical properties (Park et al., 2001; Nishio & Manley, 1988). The miscibility in multi-component polymer systems has been extensively investigated to date. Polymer blends between biopolymers and synthetic polymers are particularly significant as they could find applications as biomedical and biodegradable materials (Kondo et al., 1994; Sawatari & Kondo, 1999; Lio et al., 1995).

Due to its excellent biocompatibility, biodegradability and non-toxicity, poly(lactic acid-*co*-glycolic acid) (PLGA) has received much attention for its potential applications (Ganji & Abdekhodaie, 2010; Holzer et al., 2009; Houchin et al., 2007; Jeong et al., 2000; Loo et al., 2004, 2005; Thanki et al., 2006; Schliecker et al., 2003; Steele et al., 2011; Vey et al., 2008). PLGA has been extensively used in such biomedical fields as absorbable sutures, reconstructive implants, wound-healing materials, temporal scaffolds for tissue engineering and drug release systems (Murakami et al., 2000; Blanco-Príeto et al., 2000; Bittner et al., 1999; Cleland et al., 1997; Jain, 2000; Langer, 1995; Angelova & Hunkeler, 1999; Peppas et al., 2000), etc. PLGA films are also commonly used as artificial skin grafts (Thanki et al., 2006; Jeong et al., 2000).

Biodegradable aliphatic polyesters such as PLGA have versatile biodegradation properties because of their molecular mass and chemical compositions (Ignatius & Claes, 1996). Nevertheless, there have been many attempts to improve the properties of the polymers to render them suitable for specific applications. For instance, in order to prolong the circulation time of PLGA nanoparticles in a blood stream in vivo, the surface of the PLGA nanoparticles was coated with PLLA/PEG di-block copolymers by blending PLLA/PEG di-block copolymers with PLGA during the nanoparticle formation process (Stolnik et al., 1994). It was suggested that the surface-orientated PEG chains on the surface of nanoparticles not only suppress the adsorption of serum proteins but also reduce the extent of cell recognition (Jeong et al., 2000).

*Corresponding author, e-mail: fagangwang@126.com