

Название публикации:

PLLA-PHB fiber membranes obtained by solvent-free electrospinning for short-time drug delivery

Авторы:

Cao, K [1] ; Liu, Y [1] ; Olkhov, AA [2,3] ; Siracusa, V [4] ; Iordanskii, AL [2]

[1] Beijing Univ Chem Technol, Coll Mech & Elect Engn, Beijing 100029, Peoples R China

[2] Semenov Inst Chem Phys, Kosygin Str 4, Moscow 119991, Russia

[3] Plekhanov Russian Univ Econ, Stremyanny Per 36, Moscow 117997, Russia

[4] Univ Catania, Dept Chem Sci, Viale A Doria 6, I-95125 Catania, CT, Italy

Сведения об издании:

Drug delivery and translational research

Том: 8 Выпуск: 1 Стр.: 291-302

DOI: 10.1007/s13346-017-0463-7

Опубликовано: FEB 2018

Тип документа: Article

Аннотация:

Fibers of poly(L-lactic acid) (PLLA)/polyhydroxybutyrate (PHB) with different concentrations of the drug dipyridamole (DPD) were prepared using solvent-free melt electrospinning to obtain a polymeric drug delivery system. The electrospun fibers were morphologically, structurally, thermally, and dynamically characterized. Crazes that resemble lotus root crevices were interestingly observed in the 7: 3 PLLA/PHB fibers with 1% DPD. The crystallinity of PLLA slightly decreased as PHB was incorporated, and the addition of DPD significantly reduced the melting temperature of the composite. The interactions between PLLA and PHB mainly occurred at a proportion of 7: 3, and drug encapsulation in the fibers was verified. The kinetic profiles of drug release demonstrated the predominant multiple patterns involving a diffusional stage in the short-term mode of release and kinetic process related to the hydrolysis of the biopolymers. Furthermore, the dynamic behavior of the polymer molecules was evaluated based on the segmental mobility using probe electron spin resonance spectroscopy. The segmental mobility in the amorphous fraction of PLLA decreased with increasing PLLA content. The 9: 1 PLLA/PHB system was more resistant to polymer hydrolysis than to the 7: 3 system and the rate of diffusion transport was approximately two times higher for the 7: 3 PLLA/PHB fibers than for the 9: 1 PLLA/PHB fibers.

Ключевые слова:

Poly(l-lactic acid) film; complex thermal-behavior; poly(3-hydroxybutyrate) fibers; infrared-spectroscopy; mechanical-properties; electric-field; epr-spectra; dipyridamole; melt; release