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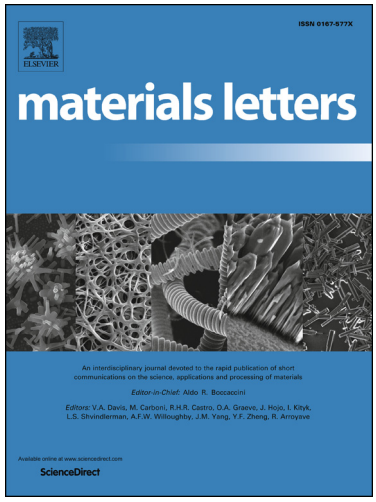

Hybrid biodegradable scaffolds of piezoelectric polyhydroxybutyrate and conductive polyaniline: piezocharge constants and electric potential study

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Hybrid biodegradable scaffolds of piezoelectric polyhydroxybutyrate and conductive polyaniline: piezocharge constants and electric potential study

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Abstract

Hybrid biodegradable piezoelectric electrospun fibrous scaffolds based on polyhydroxybutyrate (PHB) and polyaniline (PANI, emeraldine salt) were fabricated. Fourier transform infrared spectroscopy and X-ray diffraction confirmed the presence of PANi in the structure of hybrid PHB-based scaffolds. The piezoelectric coefficient d_{33} and surface electric potential under cyclic mechanical stress at the frequency of 4 Hz were increased in 4.2 times and 3.5 times, respectively, in the case of hybrid PHB scaffolds with the addition of 2 % PANi compared with pure PHB ones.

Keywords*:* piezoelectric materials, biodegradable scaffolds, conductive polymers, charge generation

1. Introduction

Electroactive materials represent a new generation of ‘‘smart’’ biomaterials that allow direct delivery of electrical, electrochemical and electromechanical stimuli to cells [1, 2]. Numerous reports have explored that piezoelectric materials can be used to prepare bioactive charged surfaces via generation of electrical charges in response to mechanical strain [3, 4].

Electrospinning has been introduced as one of the most promising techniques to fabricate scaffolds for tissue engineering as well as additive manufacturing [5] and hydrogel-based approaches [6]. Electrospinning allows to prepare scaffolds with the structure similar to that of natural extracellular matrix (ECM) [4].