Volume 6, Issue 3, 2016, 1183-1184 ISSN 2069-5837

Biointerface Research in Applied Chemistry

www.BiointerfaceResearch.com

Editorial Open Access Journal

Received: 15.03.2016 / Revised: 17.03.2016 / Accepted: 20.03.2016 / Published on-line: 01.04.2016

Editorial Preface: Special issue on functional surfaces for tissue engineering and regenerative medicine

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Editorial Preface

The interactions between biomaterials and biological environments are overseen by surface characteristics of the biomaterials. In the field of tissue engineering, biomaterials provide surfaces for the interaction between active molecules and living cells. Therefore, the ability to control the surface properties of biomaterials is of fundamental importance in design of biomedical materials. By having the basic knowledge required to design advanced biomaterials that closely mimic the host tissues, recently developed fabrication techniques and devices help us to achieve reproducible and high throughput products. It is envisioned that precise engineering at nanoscales enable us to control the elements for realized advanced biomaterials. This issue emphasize on the recent advances and important role of functional materials for tissue engineering and regenerative medicine. The goal of this special issue is to present both novel solutions to challenging technical issues for tissue engineering and regenerative medicine. This special issue contains nine papers that provide deep research results to report the advance of functional surfaces for tissue engineering and regenerative medicine. The first contribution is *"Process Parameters Optimization for Tissue Engineered Chitosan/Gelatin Nanofibrous Scaffolds"* by Salati *et al.* This paper presents a synthesis rout for the preparation of chitosan/gelatin nanofibers at several blends with different processing parameters (voltage, flow rate and distance between the tip of the needle and collector). The second paper is also for the same group entitled *"Modeling the effect of autoreactive T-cells on oligodendrocytes in multiple sclerosis patients using chitosan/gelatin nanofibrous scaffolds"*, aiming to expand their research for neural tissue engineering. They carried out assessments of the effects of MS patients' T-cells on OLN-93 cells number and morphology onto optimal fabricated nanofibrous scaffolds. They also performed mRNA analysis of oligodendrocytes for the evaluation of B7-1(CD80), B7-2(CD86), and IL-12p40 expressions. The significance of this work is that the expressions of these molecules in OLN-93 cells increased as expected by the authors. In the next paper *"Photoluminescence and Decay Characteristics of PEGylated Long Lasting Nanophosphors for Tissue Engineering Applications"*, Sepahvandi *et al.* represent sol-gel synthesis of $SrAl_2O_4:Eu^{2+}$, Dy^{3+} nanophosphors in which varied metoxy poly (ethylene glycol) (mPEG) concentrations are applied for coating the nanophosphors upon modification of the nanophosphors with phosphoric acid. This modified nanophosphor are expected to be applicable as a source of electromagnetic wave to regulate cell signaling in the engineering of the eye tissue. Referring to the forth paper *"Synthesis and characterization of surface-modified poly (lactide-coglycolide) nanoparticles by chitosan molecules for on-demand drug delivery applications"*, Jalali *et al.* present a therapeutic approach for delivery of drugs across from the blood–brain barrier is nanoparticulate drug delivery systems. They examine the effectiveness of chitosan ligands on the surface of poly (lactide-co-glycolide) nanoparticles, in order to obtain desired surface morphology and particle size for the delivery of drugs to the brain. Further, the fifth paper *"Effect of curing regime and maturation time on photopolymerisation and in vitro behavior of a polymeric light-cured calcium phosphate cement"* by Barounian *et al.* discusses the release and degradation behaviors of hydroxyethyl methacrylate (HEMA) and apatite formation of a polymeric light-cured calcium phosphate cement (PLC-CPC). The next paper *"Controlled delivery of cefixime trihydrate from organic-inorganic nanofiber composites"*, by Ramedani *et al.* deals with a study on the release behaviour of cefixime trihydrate from electrospun organic-inorganic poly(ε-caprolactone)/Gelatin/Hydroxyapatite nanofibers. This study offers techniqual solutions for better loading and delivery of cefixime trihydrate for obtaining a nearly zero-order kinetic. The next contribution *"Carboxymethyl chitosan/forsterite bone tissue engineering scaffolds: Correlations between composition and physico-chemical characteristics"* by Samadikuchaksaraei *et al.* addresses a new strategy for the enhancement of mechanical and biological properties of carboxymethyl chitosan-based scaffolds through freeze-casting and lyophilization techniques by adding various weight concentrations of the forsterite nanoparticles. In this study, the authors discuss in detail the correlations between the forsterite nanoparticles content and final characteristics of the scaffolds. Referring to the eighth paper *"Copper-doped 45S5 bioglass nanoparticles for tissue engineering applications: A comparative study"* Barabadi *et al.* present a comparative study on the sol-gel-synthesized 45S5 bioglass and copper-doped 45S5 bioglass nanoparticles, in which three different concentrations of copper are applied to determine the effective concentration appropriate for tissue engineering applications. This special issue ends with a review article entitled *"An overview on the experimental and mathematical modelings of angiogenesis and vasculogenesis"*

from Jafarkhani *et al.* in which the authors summarize various type of in vitro and mathematical models to provide a more detailed understanding of angiogenesis mechanism and its regulators in tissue engineering. This review article is important since angiogenesis and vasculogenesis are critical and multiscale processes in tissue engineering. Therefore, various developed models are listed and explained to understand how endothelial cells assemble into vessels and what factors are able to regulate it. In summary, the goal of this special issue is to suggest some new technologies and trends into tissue engineering. The papers provide clear proof that surface characteristics of new biomaterials are playing a more and more important and critical role in tissue engineering and regenerative medicine.

Editor Biography

Masoud Mozafari earned his Ph.D. degree with honors on Biomedical Engineering-Biomaterials from Amirkabir University of Technology (Tehran Polytechnic), 2013. He then joined Oklahoma State University and Pennsylvania State University as a research associate and research visiting scholar, respectively. Dr. Mozafari's research interests involve the understanding of whole field of biomaterials with respect to biological interactions, and also delivery systems for potentially useful stem cell and genetic purposes. He has over 150 pre-reviewed publications as chapter books, conference and journal papers. Dr. Mozafari has received several awards including "Top 10 National Outstanding Scientific Authors" (2011). Dr. Mozafari is currently an assistant professor and head of "Bioengineering Research Group" in Nanotechnology and Advanced Materials Department, Materials and Energy Research Center (MERC), Tehran, Iran.