7th Regional Symposium on Electrochemistry

RSE-SEE

South-East Europe

&

8th Kurt Schwabe Symposium

Book of Abstracts

May 27 – 30, 2019, Split, Croatia

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Book of Abstracts

Published by
International Association of Physical Chemists
E-mail: office@iapchem.org, URL: http://www.iapchem.org

For Publisher

Zoran Mandić

Editors

Višnja Horvat-Radošević, Krešimir Kvastek, Zoran Mandić

Design, Page Making and Computer Layout

Aleksandar Dekanski

ISBN 978-953-56942-7-4

On Line version only

POSTER PRESENTATIONS

Materials and Electrochemical Processing & Electrochemical Engineering

Poly(vinyl alcohol)/chitosan hydrogels with electrochemically synthesized silver nanoparticles for wound dressing applications

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In recent times, polymer-based hydrogel materials have presented themselves as excellent candidates for new-generation wound dressings with improved properties, such as high sorption ability, good mechanical properties and low adhesiveness [1]. Additionally, cross linked hydrogel matrices serve as excellent carriers for controlled release of antibacterial agents, such as silver nanoparticles (Ag/NPs), which are preferred over conventional antibiotics due to multi-phase mechanism of action and low susceptibility to induce bacterial resistance [2]. In this work, we aim to produce novel silver/poly(vinyl alcohol)/chitosan (Ag/PVA/CHI) hydrogels for wound dressing applications. The electrochemical route for AgNPs synthesis provided facile and green method for the reduction of Ag^+ ions inside the hydrogel matrices, without the need to use toxic chemical reducing agents [3]. The effect of chitosan content on the synthesis yield, antibacterial properties, swelling and release kinetics was investigated. The formation of AgNPs was confirmed using UV-visible spectroscopy through the appearance of plasmon resonant peaks at around 400 nm (Figure 1a), whereas transmission electron microscopy (TEM) proved the incorporation of both single and polycrystalline spherical AgNPs with diameters of 5-10 nm (Figure 1b). The swelling and silver release kinetics were investigated in modified phosphate buffer solutions (pH 7.4) at 37 °C to mimic physiological conditions. The obtained swelling isotherms and release profiles were fitted with different models to obtain kinetic and diffusion parameters (Figure 1c). The antibacterial activity was evaluated against *Staphylococcus aureus TL* and *Escherichia coli ATCC 25922* bacterial strains using an in-suspension test, and non-toxicity of both silver-containing and silver-free hydrogels was proved by MTT cytotoxicity test. The obtained results confirmed strong potential of Ag/PVA/CHI hydrogels for biomedical applications.

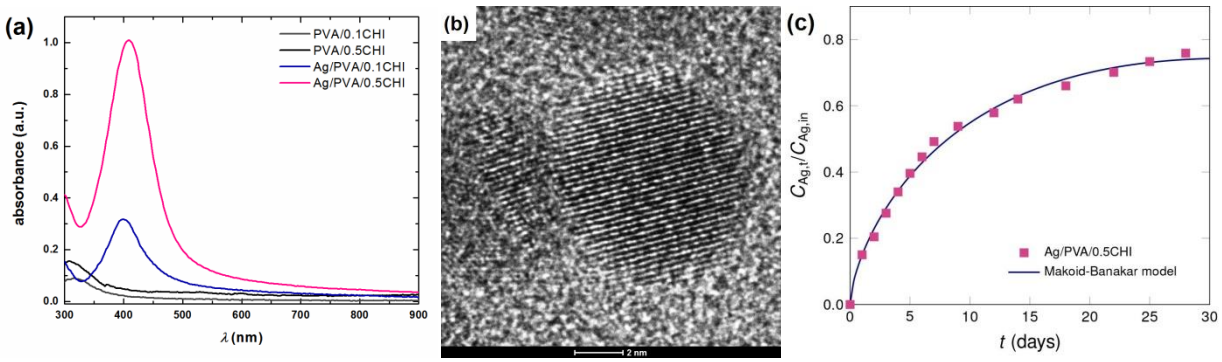

Figure 1. (a) UV-visible spectra of hydrogels with and without AgNPs; (b) TEM micrograph of AgNPs incorporated in Ag/PVA/CHI hydrogel; (c) silver release profile of Ag/PVA/CHI hydrogel with 0.5 wt% CHI fitted with a pharmacokinetic Makoid-Banakar model

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