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Ghareib W. Ali, W. El-Hotaby, Bahaa Hemdan, Wafa I. Abdel-Fattah

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Thermosensitive chitosan/phosphate hydrogel-composites fortified with Ag versus Ag@Pd for biomedical applications

Ghareib W Ali[1*], W El-Hotaby[2], Bahaa Hemdan[3] and Wafa I Abdel-Fattah[1*]

1. Refractories, Ceramics, Building materials Dept. Biomaterials Group, inorganic and mineral resources Division, National Research Centre.
2. Researcher, Spectroscopy Dept. Physics Division, National Research Centre.
3. Water pollution research Dept., Environmental Division, National Research Centre.

Abstract

Introduction: Thermo-responsive hydrogels are promising biomedical systems as their gelation is triggered by temperature changes. Greenly synthesized noble metallic nanoparticles are a growing research area assessing their potential applications in nanomedicine.

Materials and methods: Chitosan/ phosphate thermosensitive gels were successfully achieved. The developed composite scaffolds were functionalized with the greenly synthesized Ag or Ag@Pd targeting improved bactericidal activity and biocompatibility performance. The physicochemical characterization was assessed through TGA, DSC, FESEM, HRTEM, XRD and FTIR. Bactericidal activities were tested against gram- positive *Staphylococcus aureus.* and gram-negative *Pseudomonas aeruginosa*. Their biodegradability upon DMEM immersion was followed up to seven days through measuring ionic concentrations of Ca, P, Ag and Pd successively.

Key findings: The newly developed phosphatic layers over the scaffold surfaces post-immersion assessed their osteogenic ability. Further, their promising and differentiated bactericidal activities due to the noble metals incorporation were proved. Cytotoxicity assessment demonstrated their high biocompatibility since no toxic effect was recorded.

Significance: Consequently, they can be successfully and directly applied in biomedical and dental surgeries.

Keywords

β-tricalcium phosphate, Hydroxyapatite, Chitosan Injectable Hydrogel, Ag@Pd, Bactericidal, biocompatibility

*Prof. Dr. Wafa I. Abdel-Fattah, Research Prof. Emeritus. Email: nrcfifi@yahoo.com

*Dr. Wafaa Ghareib Ali, Researcher. Email: wafaaghareib@gmail.com