Sintering, microstructure, mechanical properties and antimicrobial property of HAp-ZnO Biocomposites

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Abstract

The implant associated infection is widely considered as a major concern in the field of biomedical applications and this has been the driving force for developing HAp-based biomaterials with antibacterial additives for possible use in prosthetic devices. In our present work, we sintered Hydroxyapatite (HAp) with different concentrations of zinc oxide microrods (ZnO) at 1250ºC to produce HAp- ZnO biocomposites. In vitro antimicrobial studies were carried out to understand how ZnO addition (up to 30 wt %) to HAp leads to the improvement in bacteria static/bactericidal property and thereby, can reduce bacterial infection on implant surface. Both Gram positive (S. Aureus, S. Epidermidis) and Gram negative bacteria (E. coli) were used for this study. After 4 hours of incubation, it was observed that microbial activity on HAp-20 wt % and HAp–30 wt % ZnO are significantly reduced in comparison to control sample, independent of type of bacterial cells. Despite such improvement in antimicrobial property, an increase in ZnO addition was found to have modest influence on fracture toughness or hardness properties. A maximum up to 1.7 $MPam^{1/2}$ indentation fracture toughness and hardness of up to 6.8 GPa were measured in HAp- ZnO biocomposites.

Key Words*: Hydroxyapatite, Zinc Oxide, Biocomposites, Antibacterial, Turbidometric.*

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