Synthesis of Hydroxyapatite Magnesium Oxide Nanocomposites from Naturally Occurring Dolomite and their Antimicrobial Activity

06 Nov.
NSM42

M. G. G. S. N. Thilakarathna[1;2], W. P. S. L. Wijesinghe[1;2;3;4], R. B. S. D. Rajapakse[1;2], C. A. Thennakoon[1;2], M. M. M. G. P. G. Mantilaka[1;2;3] Ajith C. Herath[4(*)], R. M. G. Rajapakse[1;2]

[1]Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka, [2]Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka, [3]Sri Lanka Institute of Nanotechnology, Nano park, Mahenwaththe, Pitipana, Homagama, Sri Lanka, [4]Department of Physical Sciences, Faculty of Applied Sciences, Rajarata Unversity of Sri Lanka, Mihintale, Sri Lanka

(*) Email:ajithch@gmail.com

Hydroxyapatite (HA), $Ca_{10}(PO_4)_6(OH)_2$ is the most abundant calcium phosphate mineral in vertebrate hard tissues and teeth. Nanocomposites of hydroxyapatite nanoparticles (HANPs) composed of biocompatible polymers, carbon nanomaterials, metals such as Mg(II), Ti(IV), Ag(I), Cu(II), and Zn(II) have shown potential applications in industry, medicine and agriculture. Development of antimicrobial materials based on HANPs has emerged in the modern biomedical field especially in bone implantation and dentistry to prevent post implantation infections. Therefore, we have synthesized MgO incorporated antimicrobial HA nanocomposite using naturally occurring dolomite minerals via a cost effective novel method. In this method, Calsine-Dolamite was reacted with calcium sucrate solution followed by the addition of a solution of ammonium phosphate. The resulted HA was reacted with $MgCl_2$ which was also synthesized from the same dolomite sample, in the presence of NH_3 to get the final product of MgO incorporated antimicrobial HA nanocomposite. Synthesized product was analyzed for its crystallinity, crystallite size, morphology, and composition, by X-ray diffraction (XRD), Scanning Electron Microscopy (SEM) and Thermo Gravimetric Analysis (TGA).Their antimicrobial efficacies on gram-negative *Escherichia coli* and gram-positive *Staphylococcus aurous* were studied. Synthesized composite showed largest inhibition zones for both bacteria but better performance on gram-negative *Escherichia coli.* The results suggest that MgO incorporated antimicrobial HA nanocomposite may be a viable candidate for bone implantation and dentistry to prevent post implantation infections and to increase the antimicrobial resistance of the hydroxyapatite nanocomposites.

Keywords: Hydroxyapatite, Magnesium oxide, antimicrobial activity