7th International Conference of Multidisciplinary Approaches (iCMA), 2020
Faculty of Graduate Studies,
University of Sri Jayewardenepura,
Sri Lanka.
ISSN: 2386 – 1509

SYNTHESIS OF CARBOXYMETHYL CELLULOSE AND ACRYLIC ACID HYDROGEL WITH ZnO NANOPARTICLES

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Abstract

Hydrogels are three-dimensional polymer network made of hydrophilic synthetic or natural polymers. Their high water retention ability affords many of the desirable properties of a wound healing process such as promoting a moist environment and debridement, good gaseous exchange, low tissue adhesion and good patient comfort through cooling and soft texture. This research emphasizes the development of a Zinc oxide nanoparticle incorporated interpenetrating polymeric hydrogel as a potential candidate for wound dressings. IPN hydrogels were synthesized by carboxymethyl cellulose (CMC) and acrylic acid (AA) using citric acid (CA) and N,N′- methylene bisacrylamide (BIS) as the crosslinking agents. CMC was selected as the main walls of the hydrogel, AA was incorporated to gain mechanical strength, CA used to crosslink CMC and was selected due to its own antibacterial activity, BIS functioned as a hydrophilic crosslinker for AA, and ZnO nanoparticles were incorporated to gain cost effective efficient antibacterial effect. SEM analysis revealed that the incorporated Zinc oxide nanoparticles were spherical in shape and the average size was 80 nm. Hydrogels were tested for swelling ratio and antibacterial properties. The developed hydrogels exhibited a wide range of swelling ratio of 5-16. Antibacterial properties were analyzed against *Pseudomonas aeruginosa*, *Escherichia coli* and *Bacillus subtilis*. A noticeable antibacterial activity towards these three microorganisms could be observed by the developed hydrogel.

Keywords: IPN hydrogel, ZnO nanoparticles, Antibacterial properties, Swelling ratio