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Synthesis and characterization of alginate beads encapsulated zinc oxide nanoparticles for bacteria disinfection in water

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Abstract

The use of polymer nanocomposites as novel materials for water remediation has emerged as a promisingalternative for disinfection of bacteria contaminated water. Sodium alginate, a natural biopolymer has been investigated in this study by encapsulating antimicrobial zinc oxide nanoparticles supported bentonite. The confirmation of the alginate nanocomposites was done by use of TEM, SEM-EDS and XRD. The antimicrobial activity of the alginate nanocomposites was investigated by batch studies using surface water and synthetic bacteria contaminated water containing Staphylococcus aureus. The effect of nanocomposite amount and initial bacteria concentration has been studied. The inactivation results indicated that the nanocomposite effectively inactivated bacteria in both the synthetic and surface water. With an amount of 0.5 g of the nanocomposites, no bacteria was observed in the water after 70 min of contact time with initial bacteria concentration of 200 cfu/ml for synthetic water and within a min, no bacteria was observed in the water for surface water. It is worth noting that 200 cfu/ml is the bacteria concentration range in which environmental water is likely to contain. Therefore, the results of this study have indicated that the alginate nanocomposites can be deemed as a potential antimicrobial agent for water disinfection.