J. Indian Chem. Soc.,
Vol. 96, January 2019, pp. 52-55

Physico-chemical characterization and antimicrobial efficiency of beta-cyclodextrin/ hydroxyapatite composite

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Manuscript received online 27 August 2018, accepted 09 October 2018

β-CDs are biocompatible, biodegradable and non-toxic materials and the central empty cavity of CDs (host) is capable of loading hydrophobic molecules (guest) through Van der Waals force and hydrogen bonds. Because of this unique structure, the physicochemical properties of the guest molecule, such as poor solubility, instability and undesired side effects can be masked. β-Cyclodextrins (CDs) are cone-shaped α-1,4-linked macrocyclic oligosaccharides with a hydrophilic exterior and a hydrophobic inner cavity that allow the formation of inclusion complexes with hydrophobic compounds. For enhancing the biological or mechanical properties of cyclodextrins incorporating it with other polymers like chitosan, gelatin and pectin has been widely investigated. To boost mechanical properties and bioactivity activities, a number of bioactive inorganic minerals and hydrophilic biopolymers have been developed for various applications. Hydroxyapatite (HAp) is one of the most extensively employed calcium phosphates owing to its similarity to the main mineral constituent of bone tissue. The bio-adaptability and versatility of β-CD and HAp makes them capable of alleviating the undesirable properties of various areas like adsorption, drug delivery and bone tissue engineering through the formation of inclusion complexes. The prepared composite has been characterised by using FT-IR, XRD, TGA and DSC analytical techniques and also the effect of β-CD/HAp composite towards bacterial species like *Escherichia coli, Staphylococcus aureus* and *Klebsiella pneumonia* and fungal species like *Aspergillus niger, Aspergillus flavus* and *Mucor mucedo*. Using characterisation techniques it was concluded that intermolecular interactions between the two components and chemical compositions of the prepared material. The enhanced antimicrobial activity of the composite may thus provide an opportunities for potential use as an alternative biomaterial for bone tissue engineering applications.

Keywords: Cyclodextrins, bioactive mineral, hydroxyapatite, characterisation, bacterial species fungal species.