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YUCOMAT 2022

&

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XII WRTCS

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Composite hydrogels based on gelatin, hydroxypropyl methylcellulose and Mg-doped biphasic calcium phosphate for biomedical applications

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Hydrogels are three-dimensional hydrophilic networks of polymers capable of retaining large amounts of water or biological fluids, which makes them attractive for biomedical and pharmaceutical applications. Although various types of polymers have been investigated as hydrogels for biomedical purposes, those obtained from natural polymers have intrinsic advantages as they are abundant, cheap, biocompatible and biodegradable. Gelatin is a natural polymer that has been applied in biomedicine due to its low price, biocompatibility, and biodegradability. HPMC, a derivative of cellulose, is a hydrophilic, biodegradable, and biocompatible polymer. However, natural polymer-based hydrogels have low mechanical properties and are relatively soluble in physiological conditions, which requires creative cross-linking strategies to improve the functionality of the hydrogels. The citric acid (CA) is an inexpensive and non-toxic compound that has been proven to be an effective crosslinker for natural polymers. In addition, the incorporation of bioactive calcium phosphate particles could further improve mechanical properties and add new functionalities to the hydrogels.
In this work, we present novel composite hydrogels for biomedical applications, based on CA-crosslinked gelatin/HPMC (HPMC-G) matrix and Mg-doped biphasic calcium phosphate filler (BCP). Firstly, the HPMC-G hydrogels crosslinking conditions were optimized. Different CA concentrations, curing temperatures (140-180°C) and times (3-9 min) were applied. During the second step, the optimaly crosslinked HPMC-G hydrogel was incorporated with different amounts of BCP. BCP was obtained by calcination of Mg-doped hydroxyapatite (HA) powder synthesized by the hydrothermal method. XRD analysis confirmed that powder was constituted only of HA and beta-tricalcium phosphate. The obtained composite hydrogels were characterized by mechanical testing, FTIR, SEM, swelling behavior and drug deliverability.