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Title: Preparation of Ag loaded chitosan/gelatin aerogels

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ABSTRACT (Space limited to 2200 characters)

Silver nanoparticles (AgNP) are widely used for antimicrobial and wound healing purposes. However, their effectiveness highly depends on the production method and homogeneous dispersion in the medium to prevent aggregation.

Gelatin (Gel) is a water soluble protein derived by hydrolysis of collagen. It has favorable properties such as low antigenicity, biocompatibility, bio-safety, bio-degradability, and relatively low cost. The hydroxyl group of hydroxyproline aminoacid facilitates the in-situ reduction of $AgNO_3$ and the nonpolar amino acids contribute to the stability of AgNP. Thus gelatin can be successfully used to obtain and stabilize silver nanoparticles.

However, gelatin is often blended with natural or synthetic polymers to improve its mechanical properties. One example is chitosan (Ch), a polysaccharide derived from the chitin, with various beneficial characteristics, e.g.,film-forming ability, stability, and flexibility. Chitosan can make up for the unsteady gelatin molecular skeleton and water instability and gelatin can induce chitosan ionic gelation forming a physical cross-linking, and together they can create a stable gel structure for Ag NP.

In this communication, we present the preparation of Ag-loaded gelatin/chitosan aerogel. Gelatin is used as a reducing agent and stabilizer to restore AgNP in situ, which are cross-linked with chitosan, and then dried with supercritical CO_2 to obtain an AgNP/Gel/Ch aerogel. The mechanical, physicochemical, and thermal properties of the AgNP/Gel/Ch gel are investigated. The effect of the different drying processes on aerogels morphology is also assessed. Finally, the antibacterial properties of AgNP/Gel/Ch aerogel are also evaluated.

Results show that gelatin enriched with chitosan provides better stabilizing activity for AgNP. The thermal stability and mechanical properties of the hydrogels are also improved. The structure is maintained when supercritical drying was performed at 40ºC and 200 bar. The average pore size of the AgNP/Gel/Ch aerogel was 100-200 nm. The AgNP/Gel/Ch has promising antibacterial and 3D structural properties with characteristics required in modern wound dressings.