Hybrid Porous Materials from Starch/κ-Carrageenan/ PVA and Starch/κ-Carrageenan/PVA-SbQ for Tissue Engineering

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Cryogels are obtained by freeze drying of wet gels from different sources. Freeze drying is a highly economic, simple and environmentally friendly processing technique to obtain porous materials[1,2]. Porous materials, namely cryogels or aerogels, from polysaccharides have been developed since the 1930's, emerging as promising materials for applications in the environmental and biomedical field[1,3,4]. The addition of synthetic polymers to the polysaccharide network may improve some mechanical and physical properties of the gels like brittleness and compressive strength, thus enhancing the film-forming capability, flexibility of the porous material, and its solubility on water[5]. Namely, hybrid cryogels of polysaccharides and synthetic polymers, such as poly(vinylalcohol) (PVA) and poly(vinylalcohol)-g-N-methyl-4(4'-formylstyryl)pyridinium methosulfate acetal (PVA-SbQ) can generate a mechanical reinforced architecture due to the covalent crosslinking and the intermolecular interaction between the synthetic and the natural polymers, specifically hydrogen bonding with starch molecules[2,5,6].

In this work, macroporous starch/κ-carrageenan cryogels were produced by freeze drying, targeting tissue engineering applications. PVA and PVA-SbQ were added during cryogel process to study their effect on the mechanical properties and water solubility. The mechanical and solubility responses of the porous materials were tuned by the starch/κ-carrageenan/PVA and PVA-SbQ biopolymers composition. The characteristics of the resulting materials suggest that they are suitable to be used as extracellular matrix for tissue engineering.

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