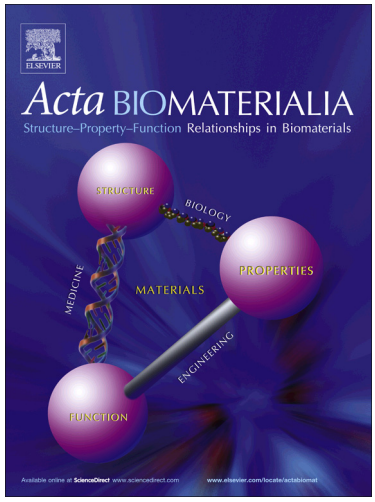

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Laponite nanoparticle-associated silated hydroxypropylmethyl cellulose as an injectable reinforced interpenetrating network hydrogel for cartilage tissue engineering

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Abstract

Articular cartilage is a connective tissue which does not spontaneously heal. To address this issue, biomaterial-assisted cell therapy has been researched with promising advances. The lack of strong mechanical properties is still a concern despite significant progress in three-dimensional scaffolds. This article's objective was to develop a composite hydrogel using a small amount of nano-reinforcement clay known as laponites. These laponites were capable of self-setting within the gel structure of the silated hydroxylpropylmethyl cellulose (Si-HPMC) hydrogel. Laponites (XLG) were mixed with Si-HPMC to prepare composite hydrogels leading to the development of a hybrid interpenetrating network. This interpenetrating network increases the mechanical properties of the hydrogel. The *in vitro* investigations showed no side effects from the XLG regarding cytocompatibility or oxygen diffusion within the composite after cross-linking. The ability of the hybrid scaffold containing the composite hydrogel and chondrogenic cells to form a cartilaginous tissue *in vivo* was investigated during a 6-week implantation in subcutaneous pockets of nude mice. Histological analysis of the composite constructs revealed the formation of a cartilage-like tissue with an extracellular