NANOCOMPOSITE HYDROGELS FOR BIOMEDICAL APPLICATIONS

J.F. Tassin[1], F. Xie[1], P. Weiss[2]

1 - Universite du Maine
2 - Universite de Nantes

tassin@univ-lemans.fr

Osteoarticular engineering requires in-situ formation of crosslinked hydrogels with controllable mechanical properties. Furthermore, the hydrogels need to show a large enough porosity to allow the diffusion of nutriments and cells. We will present recent work on crosslinkable hydrogels triggered by lowering the pH, based on silanized hydroxypropylcellulose. Rheometry is a useful tool to study the kinetics of formation of the hydrogel and its final modulus. In order to increase the modulus of the gel, we investigated the influence of the introduction of nanofillers such as Laponite, at very low concentrations. The acceleration of the kinetics as well as an enhancement of the modulus by a factor 10 has been demonstrated using an optimized choice of the particles and of the introduction method.
These changes have been associated to the formation of 3 different types of networks. 2 are of chemical origins and due to chemical reactions either between silanized polymer chains and silanized groups and particles. One is a physical network, due to interaction between particles. These findings were substantiated by ^{29}Si NMR studies to account for chemical reactions and laser confocal scanning microscopy where the organization between particles inside the hydrogel in relationship with the formulation has been characterized.