הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע"ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Seminar
Lecture Hall 6, Wolfson Department of Chemical Engineering,
Wednesday November 7th at 1:30pm

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Hydrogels physically cross-linked with nanogels

Self-assembly via non-covalent crosslinking provides a route to form injectable hydrogels with shear- thinning and self-healing properties arising from dynamic and reversible crosslinks. Due to the dynamic nature of these weak physical associations, formed networks can be dissociated under applied shear, the hydrogels flow and deform into liquids and recover back into hydrogels when stress is removed. Shear- thinning behaviour enables a pre-formed hydrogel with desired physical properties, as characterized ex vivo, to be delivered in vivo via application of shear stress during injection. As the hydrogel is pre-formed ex vivo, the effect of the local environment on cross-linking is almost negligible. Additionally, the recovery of elastic modulus after shear (self-healing) may be much faster in shear-thinning hydrogels than the gelation process of sol-gel types of hydrogels, reducing the risk of leaking precursor solutions and unreacted reagents.

In recent years nanosized particles hydrogel termed nanogels have gained considerable attention as one of the most promising nano drug delivery systems owing to their unique potentials via combining the characteristics of a hydrogel system with a nanoparticle.

This study proposed a new shear thinning and self-healing hydrogel based on polymer-nanogels interactions. The new hydrogel system combines pectin polymer chains physically cross-linked by chitosan nanogels. Shear thinning and self-healing behavior were demonstrated using rheology tests. The influences of the nanogels concentration on the recovery rate and gel properties were evaluated using DLS, swelling and strength tests. DLS measurements detected nanoparticles with an average diameter of 980 nm. Rheology measurements and strength test showed that the modulus increases with nanoparticle concentration which is in line with the suggestion that the nanoparticles function as crosslinkers. The swelling degree of the hydrogels decrease with nanoparticle concentration. This is the first time that polymer-nanoparticle hydrogel based on a pair of polysaccharides is reported.

Refreshments will be served at 1:15pm