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

Monday, August 21st, 2023, at 14:00

Room 1

Physically crossed-linked locust bean gum - κ-carrageenan hydrogels

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MSc Seminar

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Hydrogels are three-dimensional network structures able to imbibe high-water content, yet they are usually resistant to dissolution due to the cross-links between their network chains. Some applications, however, can benefit from controllable hydrogel dissolution. The primary challenge lies in developing mechanically stable hydrogels with controllable dissolution rates under physiological conditions.

In this research, we used κ-carrageenan nano-gels (NG) prepared by chemical cross-linking of κ-carrageenan with glutaraldehyde. The new NG was added to locust bean gum (LBG) -κ-carrageenan (k-car) hydrogels to develop a new shear-thinning self-healing hydrogel. LBG and k-car are known to have synergistic interactions, and their gelation mechanism is based on physical interactions that are relatively weak compared to chemical interactions. The advantage of physical interactions is their reversible nature that enables the reform of cross-linking bonds after high shear stresses are applied. Adding NG to the physically cross-linked LBG-k-car hydrogels alters the existing interactions and leads to the dissolution of the hydrogels. Compression, swelling, rheology, and Cryo-SEM measurements were done to characterize the new hydrogels' mechanical properties. It was found that LBG-NG and LBG-k-car-NG gels displayed faster dissolution rates than LBG-k-car hydrogels that did not completely dissolve within 50 days. The modulation of k-car and NG concentrations offers a means to finely adjust the dissolution rate of the hydrogels. The gels' ability to dissolve in physiological conditions makes them valuable for diverse applications, including their use as sacrificial materials for wound dressing and 3D printing.

Refreshments will be served at 13:15