Technion-Israel Institute of Technology
Faculty of Mechanical Engineering

הטכניון-מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ה' 26.04.2018 (יא' באייר, תשע"ח), בניין דן קאהן, אודיטוריום 1, 13:30.

מרצה: יונתן רוטבאום

מנחה: פרופ' דניאל ריטל

על הנושא:

על התכונות המכאניות של ג'לים בעלי יכולת קפיאה הפוכה

Some results on the mechanical properties of inverse freezing gels

The seminar will be given in Hebrew

תקציר ההרצאה :

Methyl cellulose (MC) hydrogels are one of the few known inverse freezing (IF) materials. These hydrogels are abundantly employed in a variety of applications, rendering study of their mechanical properties relevant and important. Unlike most of the common materials which soften upon heating, IF freezing materials becomes harder with the elevation of temperature, which makes them a favorite candidate for a verity of applications. This work presents experimental campaign which examines the effect of the inverse freezing on the mechanical properties of MC hydrogels. Quasi-static compression experiments reveal how the MC concentration and environmental temperature affect the MC gel flow stress. High rate Hopkinson compression experiments (~1500sec-1) reveal a strong strain rate sensitivity, which contradicts previous rheological experiments with the same material. Using high speed photography, we successfully found evidence for shock induced gelation that can explain the significant increase in the measured flow stress in comparison to the rheology experiment. In addition to the mechanical characterization, this work will present several attempts to engineer an improved MC hydrogel-nanoparticles composite. Some of the tested gel-nanoparticles reinforced composites exhibit improved flow stress while improving the inverse freezing transition. Using cryo-transmission electron microscopy (Cryo-TEM) we observed an increased density of MC fibrils around B4C aggregate, which indicate a chemical connection of the MC fibrils to the B4C particles. Finally, we have identified the energy absorption capability of MC based solutions for weak and strong impacts, i.e. in the linear and nonlinear shock regime. Those results provide a first step towards a new improved way to mitigate shocks in protective structures.

בברכה,

שפופ"א מתי סאס
מרכז הסמינרים