ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ
ΤΜΗΜΑ ΕΠΙΣΤΗΜΗΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΑΣ ΥΛΙΚΩΝ

ΠΑΡΟΥΣΙΑΣΗ ΜΕΤΑΠΤΥΧΙΑΚΟΥ ΔΙΠΛΩΜΑΤΟΣ ΕΙΔΙΚΕΥΣΗΣ

Τίτλος

«Rheology and dynamics of tunable soft materials: from synthetic microgels to biological hydrogels»

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Πέμπτη, 25/10/2018,

3:00 μ.μ.,

Αίθουσα Α2,
Κτίριο Τμήματος Επιστήμης Υπολογιστών,
Πανεπιστήμιο Κρήτης

Hydrogels represent a class of supramolecular networks which are ubiquitous in daily life, with applications ranging from food technology to biology. In this work, we investigated the tunable rheology of two such interacting hydrogels, which constitute the main paradigms of soft matter, colloids and polymers. First, we examined the kinetic arrest of synthetic PNIPAM microgel particles with tunable effective volume fraction by means of altering temperature and/or mass concentration. Reaching the same effective volume fraction reached by increasing concentration or by reducing temperature at lower concentration, we compared the rheology and identified differences between thermal and jammed glass regimes. Second, motivated by the defense mechanism of hagfish against predators, we obtained the main constituent protein, mucin vesicles and explored the properties of the resulting biopolymer network in different pH environments which promote its formation. We focused on the extensional response and dynamic structure in pure water, by adding salts and in artificial seawater, as functions of concentrations. We identified appropriate handling protocols and attempted at linking stiffness with macromolecular structure. Our results provide ingredients for understanding complex mechanisms associated with rheological functions and tailoring the flow properties of such systems toward the eventual molecular design of hydrogels with desired response.