ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ

ΤΜΗΜΑ ΕΠΙΣΤΗΜΗΣ & ΤΕΧΝΟΛΟΓΙΑΣ ΥΛΙΚΩΝ

UNIVERSITY OF CRETE

DEPARTMENT OF MATERIALS SCIENCE & TECHNOLOGY

ΠΡΟΣ
1) Όλα τα μέλη ΔΕΠ του Τμήματος Επιστήμης και Τεχνολογίας Υλικών
2) Την Επταμελή Εξεταστική Επιτροπή
3) Όλα τα μέλη της Πανεπιστημιακής Κοινότητας

Πρόσκληση σε Δημόσια Παρουσίαση της Διδακτορικής Διατριβής της

κ. Μπόγρη Παναγιώτας

(Σύμφωνα με το άρθρο 41 του Ν. 4485/2017)

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θα γίνει η δημόσια παρουσίαση και υποστήριξη της Διδακτορικής Διατριβής της υποψήφιας διδάκτορος του Τμήματος Επιστήμης και Τεχνολογίας Υλικών

κ. Μπόγρη Παναγιώτας με θέμα:

«Δυναμική Πυκνών Κολλοειδών Διασπορών»

« Dynamics of Concentrated Colloidal Suspensions»

Abstract:

Colloidal suspensions play a significant role in our daily life since they are encountered in a wide range of natural, biological and industrially relevant products, such as foams, gels, emulsions, pastes, lubricants, paints, pharmaceuticals etc. During industrial processing, these materials are imposed in shearing, which affects their microstructure and the mechanical properties of the final product as well. Thus, for the successful manipulation of these products, it is crucial the deep understanding and the control of the interplay between structure, dynamics and rheological behavior of colloids both under quiescent conditions as well as under shear.

This dissertation is focused on the study of structure and dynamics of three classes of colloidal systems of different nature and architecture, by using various techniques, such light scattering, rheometry and microscopy.

Firstly, we examined the structure and hydrodynamic properties of randomly oriented prolate ellipsoids of various aspect ratios suspended in aqueous solutions by using Polarized (DLS) and Depolarized Light Scattering (DDLS). Besides low ionic strength suspensions, we also explored suspensions with added salt.

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Secondary, we investigated the structure and dynamics of suspensions of soft isotropic core-shell colloids with different molecular weight polymer chain grafted on a hard core, in the liquid and glassy regime. In the liquid regime, we used 3D-Dynamic Light scattering (3DDLS) to eliminate multiple scattering contributions due to high refractive index mismatch between solute and suspended medium. In the glassy regime, we used Multi-Speckle Dynamic Light Scattering (MSDLS) to explore the kinetically arrested dynamics, by following the evolution of the slowest relaxation of the intermediate scattering function. Depending on the volume fraction and the polydispersity, structural rearrangements led or not to glass-crystal transitions.

Finally, we studied thermosensitive core-shell colloidal systems of different softness at low ionic strength. The hybrid core-shell particles consists of a rigid polymeric core onto which a microgel shell is affixed. In these systems, we gradually tuned the interactions from repulsive to attractive by changing the temperature below and above the LCST, in order to examine how the switch of the interactions affects the structure and dynamics in both dilute and concentrated regime. For concentrated suspensions, these temperature changes allow the switch between repulsive glasses, repulsive liquids and attractive colloidal gels. We also explored the case of screening the electrostatic interactions by increasing the ionic strength at sufficiently high salt concentrations leading to interesting aggregation phenomena. For this investigations, we employed various techniques, such as light scattering, capillary viscometry, confocal microscopy and linear and nonlinear rheology at both quiescent conditions and under shear.

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