

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ  
ΤΜΗΜΑ ΕΠΙΣΤΗΜΗΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΑΣ ΥΛΙΚΩΝ

ΠΑΡΟΥΣΙΑΣΗ ΔΙΔΑΚΤΟΡΙΚΗΣ ΔΙΑΤΡΙΒΗΣ

**Τίτλος:**

*«Investigation of Polymer Nanostructures in Multiconstituent Hybrid  
Systems»*

**Ελένη Παυλοπούλου**

Μεταπτυχιακή Φοιτήτρια

Τμήματος Επιστήμης και Τεχνολογίας Υλικών, Πανεπιστημίου Κρήτης

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**Αίθουσα Σεμιναρίων 3<sup>ος</sup> όροφος,  
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#### **ΠΕΡΙΛΗΨΗ**

The fabrication of nanostructures and the investigation of their properties constitute a research area that has attracted the interest of the scientific community, because such nanohybrids are candidates for a number of novel applications. The study and understanding of the behavior of these new materials is very important in that it allows the optimization of their properties. In order to be able to understand and consequently control those characteristics, several material combinations are tested and multiconstituent systems are fabricated. As an example, soft materials with desirable mechanical properties, such as polymers, are appropriately mixed with

inorganic moieties. Such mixtures may exhibit good electronic, optical or magnetic properties and generally the components are selected in such a way, that the hybrid materials own the desirable properties that are a unique combination of the properties of the parent materials.

In this research, three types of nanohybrid materials are investigated with small-angle X-ray scattering with respect to their structural properties: A) Block copolymers blended with a selective homopolymer at a low concentration; micelles with radii of approximately 10 nm are formed within the polymeric matrix and their characteristics are controlled by the copolymer macromolecular architecture and composition, the copolymer concentration and utilization temperature, as well as by the homopolymer characteristics. B) Metal nanoparticles incorporated within pH-responsive polymeric matrices; suitably chosen micelles and microgels, with radii of 15 nm and 110 nm, respectively, are used as nanoreactors for the synthesis of Pt nanoparticles and the nanohybrids are characterized during all the synthetic steps and for various synthetic routes. C) Polymer – layered silicates nanocomposites; inorganic clay platelets are mixed with a semi-crystalline polymer, which intercalates within the galleries, and the effect of the clay presence on the crystallization kinetics and final properties are investigated.

Through the study of these multiconstituent systems, the ability of polymers to form or participate in the formation of a rich wealth of nanostructures is demonstrated. Each one of the resulting nanohybrids is an attractive system for high-impact technological applications due to the ability to control and tailor the structure and sizes of the final products.

Ο Πρόεδρος του Τμήματος

N. Πελεκάνος