



# ΣΕΜΙΝΑΡΙΟ

## Femtosecond Laser Formation of Self-Organized Micro/Nanostructures on Metallic Surfaces and their Thermal/Fluids Applications

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### Abstract

The use of micro/nanostructured surfaces has become very promising in research areas such as heat transfer enhancement, drag reduction/enhancement, anti-icing and bacteria growth prevention. Through the use of femtosecond laser surface processing techniques, we have demonstrated the control of self-organized micro/nanostructure formation on a wide range of metals including a number of stainless steel alloys, aluminum, nickel, titanium, Inconel 740H, Zircaloy-4 and copper. Three specific classes of structures are presented: above surface growth mounds (ASG-mounds), below surface growth mounds (BSG-mounds) and nanoparticle covered pyramids (NC-pyramids). These unique structures form through a balance of material ablation, fluid flow, and material re-deposition that is determined by the laser fluence and the number of pulses used during processing. Within each structure class, we present the ability to fine tune the size and shape of the surface structures. We demonstrate how the self-organized micro/nanostructures and changes in surface chemistry, produced through femtosecond laser surface processing, can be used to functionalize the wetting properties. Through pool boiling experiments we show enhanced two phase heat transfer characteristics, increased Critical Heat Flux and an extraordinary shift in the Leidenfrost temperature for delayed film evaporation.