Investigator:	George Gogos
Position Title:	Professor
Department:	Mechanical & Materials Engineering
Email:	ggogos@unl.edj
Phone:	(402) 472-3006
Webpage:	http://engineering.unl.edu/academicunits/mechanical-materials/faculty-staff/GeorgeGogos.shtml

Numerical Modeling of the Formation of Micro/nanostructures on Metals Using Femtosecond Laser Surface Processing

Abstract.

A new generation of biologically inspired micro/nanostructured metal surfaces promises to disrupt critical heat transfer applications, such as those in the power industry and the cooling of electronic equipment. Specifically: a) we are reinventing the boiling curve, one of the most important engineering pieces of information in the power industry, including nuclear, that will directly impact the operational temperature range and efficiency of heat transfer systems, and, b) we are reinventing metal microchannel heat exchanger technology that will enable efficient heat removal in current and future electronic equipment that generate ultra-high heat fluxes. We have assembled an interdisciplinary research team between the Electrical and Mechanical & Materials Engineering departments at UNL to apply multiscale surfaces fabricated using femtosecond laser surface processing, which is a dynamic fabrication technique that produces highly permanent surface structures that can withstand high temperatures necessary for many heating and cooling applications. This effort has led to several technological advances and multiple publications. The proposed research, the synergistic development of a comprehensive and predictive numerical model of the formation of multiscale structures via femtosecond laser irradiation, fills a critical gap in our research capabilities. We have attracted the attention of several program directors and have targeted many external funding sources. Furthermore, we have received direct feedback that the proposed research is of considerable interest and that it is necessary, if we are to become truly competitive for major external funding.